









# THE NATIONAL ENCYCLOPEDIA

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# The National Encyclopedia

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## METHOD OF CROSS REFERENCES

*Words in the articles printed in large and small capitals indicate that there is an article on that subject elsewhere in The National Encyclopedia*

# The National Encyclopedia

## MINING M PERSHING

**MINING, COAL.** Coal occurs as a blanket or stratified deposit like slate, clay or sandstone, though in places the blanket has been tilted and folded until vertical or almost upside down.

COAL originally formed as PEAT, which was covered with rock-forming sediments and subjected to heat and pressure, being converted successively into BROWN COAL, LIGNITE, sub-bituminous, BITUMINOUS and semi-bituminous coals, and further into semi-anthracite, ANTHRACITE and even a sort of GRAPHITE. Coals are found in all these stages. The general tendency is for the peat to lose a little of all its constituents, especially its oxygen and hydrogen, and to increase its percentage of carbon until, as anthracite coal, it has ten or more times as much carbon as volatile matter.

Peat contains earthy matters, technically known as "ash" taken up by the vegetation, and some deposited in the peat bog by water. As the vegetable matter loses oxygen and hydrogen in coalification, the most highly developed coals usually contain the most ash. However, some of these coals, such as anthracite and semi-bituminous coals formed from unusually pure peat, are occasionally found remarkably free from "ash." Another impurity is sulphur, either derived from vegetation or from sulphatic waters, perhaps sea water. The sulphate material, if it results from a recent impregnation, is still a sulphate of lime, but if it came into the peat bog during, or soon after, deposition it may have been converted to iron sulphide, that is, pyrite or marcasite. Semi-bituminous coal, if clean, will give the greatest quantity of heat units on burning because it contains uncombined hydrogen. All coals contain some water or moisture, which can be driven off below 100° C. Brown coal may contain as much as 60% moisture.

Apparently, it was during the CARBONIFEROUS PERIOD that extensive peat bogs first made their appearance, and most of the world's coal now comes from deposits of that period. That in eastern United States is mostly Carboniferous, though TRIASSIC PERIOD coals are found in Virginia and North Carolina and lignites of the CRETACEOUS and TERTIARY PERIODS in the Gulf States. Along the western front of the Appalachian Mountains the coal is all low in volatile matter, being anthracite and semi-anthracite in eastern Pennsylvania and semi-anthracite in parts of Virginia. Large areas are semi-bituminous. Progress-

ing westward, coal has more volatile matter. At Pittsburgh the coal is of a true bituminous type and in Iowa it has almost the qualities of a sub-bituminous fuel. Coals found in, and west of, the Rocky Mountains are of more recent origin, being of Cretaceous and Eocene age, but they have been subjected to such extensive METAMORPHISM by earth movement and VULCANISM, and covered in some cases with such deep deposits, that the coal varies from anthracite to lignite, with a large proportion still sub-bituminous and lignitic. The United States has about 52% of the known resources of the world.

Beds of coal vary greatly in thickness, some being hundreds of feet thick with only small partings of dirt. These, however, are quite unusual. Seams are found in all thicknesses, a favorable thickness for mining being 6 ft.

Doubtless, all the coals which have reached a more complete development than brown lignite have been, at some time, covered by hundreds, even thousands, of feet of sedimentary deposits. In many cases EROSION has removed a large percentage of these deposits, the coal itself often being washed away with them.

Some SEAMS of coal extend under hills and their edges are revealed in the sides of valleys. These seams, if they are still nearly level, are entered by level or

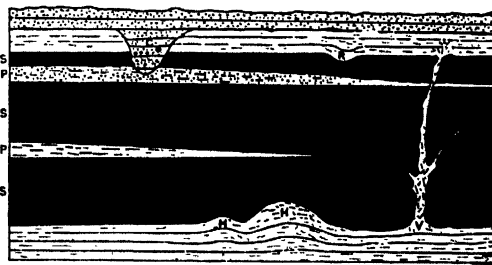


DIAGRAM OF A COAL SEAM

Coal, is in black; other rocks dotted and dashed. C, "cut-out"; H, "horseback"; P, "parting"; R, "roll"; S, "split"; V, "clay vein".

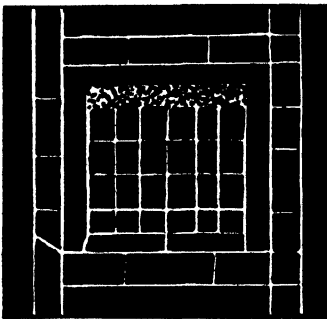
nearly level openings called drifts. Such drifts, if they go completely through to another valley are termed tunnels. Sometimes, however, the seam has been tilted and the openings made in it are driven

## MINING

either downhill or uphill to follow the seam. In this event, they are termed slopes and the coal is raised or lowered to the opening by ropes. With a drift, electric locomotives or, more rarely, mules or horses are used for haulage.

Sometimes the coal lies so near the surface over so large an area that the covering dirt can be entirely removed and the coal recovered. This is the oldest form of mining. To-day big shovels and drag-line excavators, with regular trains of railroad cars, are used to remove and carry away the overburden, or overlying material. All these open workings are termed strippings or strip pits.

Sometimes the coal is deep and a slope may have to be driven down to it through the rock. If it is over 100 or 200 ft. deep, a shaft or vertical opening may be made, the mine cars being hoisted to the surface on a cage. Cage, in mining, designates the elevator, travelling up and down in the shaft, used to transport men to and from the various working levels and the surface. A skip is the container in which ore and rock are hoisted through the shaft to the surface. Sometimes cars of ore are hoisted in the cages. Where the coal is rumped badly it may be better to put down a shaft in the rock, even though the coal comes to the surface. Then drifts or levels are extended from the shaft. In laying out a mine the seam, if level or nearly level, is divided by roadways or ENTRIES into PANELS 1,000 or 2,000



E. S. MOORE, COAL, JOHN WILEY & SONS

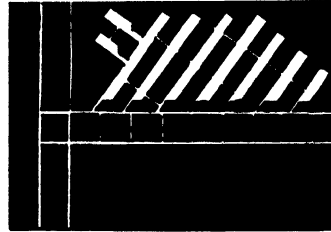
**PANEL SYSTEM OF MINING COAL**

*The area to be mined is divided into rectangular blocks which are mined out as units. A pillar is left on three sides*

ft. long and about 300 to 600 ft. wide. Air has to be forced through the entries and for this reason two or more HEADINGS are driven concurrently so that the air will have entry and return paths. Short crossways connect the two entries every 60 or 100 ft., and when a new one is made the nearest old one is closed. Air passes from the surface to the entries through drifts, slopes or shafts, or a combination of these. If there is no natural ventilation fans are used to force the air through the mine. The weight of the air daily circulated through a mine is often as much as twenty times the weight of the coal which is produced daily.

Some coal is obtained from the entries but the

panels are, of course, the main source. From the sides of the entries ROOMS are driven. The opening, or neck, of the room is narrow and usually to one side, and, as the weight of the mine roof is tremendous, the wall or PILLAR is left quite thick, usually about 30 ft. Beyond the neck the room widens, to possibly, 20 or 30 ft. The rooms are made 200 to 300 ft. long,

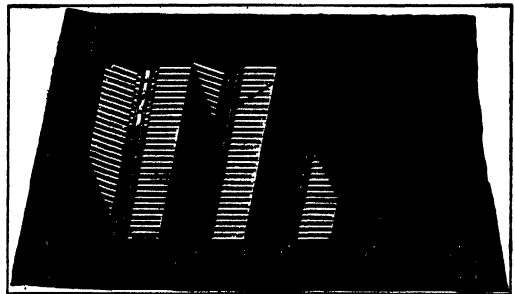


ROOMS DRIVEN AT INCLINATION TO ENTRY IN DOUBLE ENTRY MINE

and between them are left walls, or pillars, 20 to perhaps, 100 ft. wide, to support the heavy weight of overlying material. Coal mines in the United States are rarely over 1,200 ft. deep but at that depth the pressure is about 100 tons per sq. ft. before any mining is done.

When the rooms are completed the miners begin to remove the pillars, commencing from the far end. They do it methodically so that the ends of the pillars in adjacent rooms will line with each other. As soon as enough coal is removed, the roof cracks and falls, or else settles, relieving some of the weight. Finally, all the coal in the panel is removed, and where there was solid coal and later rooms, there is nothing but fallen rock. The pillars are left along an entry to protect it, but if the entry is not needed these pillars also are removed.

Another method of mining is by the longwall



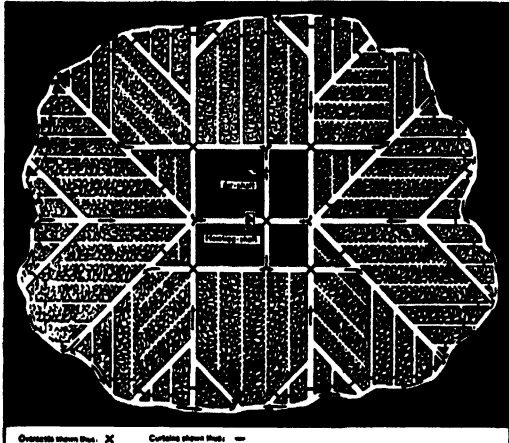
FROM E. S. MOORE, COAL, JOHN WILEY & SONS

**PLAN OF A COAL MINE WORKED BY FOUR ENTRY SYSTEM**  
*Methods of "drawing" or mining the pillars also shown*

method. At first that consisted of leaving a large pillar around the shaft for its protection, thereafter removing all the coal beyond and supporting the roof around the roads by rock walls. The working wall was known as a longwall and was made circular with roads radiating from the shaft. Subsequently, roads were run at a slight angle to the longwall with short

spurs from them to points near the sections in which men were working. These were usually temporary. In longwall mining the roads are single, the air going in by one main road and back by the working faces. It is by longwall mining that the thinner beds are operated economically.

Lately, the circular longwall has become outmoded



FROM E. S. MOORE, COAL, JOHN WILEY & SONS

#### PLAN OF LONGWALL MINING

Arrows show ventilating currents to and from working faces. Overcasts and curtains are used to direct the currents into the proper entries

and rectangular places are now driven 300 to 600 ft. wide with one road up the middle, supported by back walls, the face being at right angles to the road. Conveyors on either side, loaded by the men at the face, bring the coal to the main road, where it is loaded into cars.

In modified forms of longwall mining the entries are driven as in room-and-pillar mines, but the panel between the entries is removed as a single longwall. This may start at the end of the panel nearest the mine opening and be worked "inbye" or inward. When it is worked "outbye" or toward the mine opening, the entry pillars are removed as the longwall progresses. *See also* COLLIERY; BORD-AND-PILLAR; ROOM AND PILLAR; ROBBING PILLARS. R. D. H.

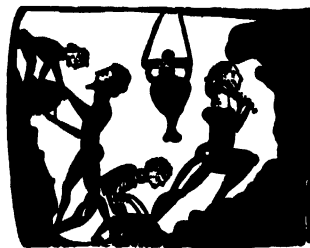
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**MINING, HYDRAULIC**, a method of extracting minerals from alluvial, usually gold, deposits; a stream of water under high pressure is directed against the bed of gravel in which the gold occurs, disintegrating the gravel and carrying it to sluices (*see* MINING, PLACER) in which the gold is removed. The water is directed through a "hydraulic giant," a nozzle with a double joint which can be turned in a horizontal and in a vertical plane. A large-sized giant, under a head of 500 ft., will spout 50 cu. ft. of water per

second at a velocity of 180 ft. per second. Where the slope of the ground is insufficient, hydraulic elevators are used to raise the water and gravel to a higher level, from which it can then be carried away through sluices. In these elevators, water under pressure forces the material up a pipe to a discharge outlet at the desired higher elevation. B. L.

**MINING, METAL.** The art of metal mining dates back to the dawn of civilization. Native copper was mined by the Indians in the Lake Superior district, and precious metals were mined by the Incas. The Phoenicians obtained tin from Cornwall; the Laurium mine yielded large quantities of silver to ancient Greece; and the Romans still later worked the copper deposit at Rio Tinto, Spain (*see* METALS).

Metal mining, due to its nature, was the first industry conducted on a large scale. In ancient times, the mines were worked by slaves. In the Middle Ages, while the individual artisan, with a few apprentices prevailed in other trades, mining was already carried on with a comparatively large number of workers. Through the necessity of pumping, machinery was used in metal mining earlier than in other industries; steam pumps were employed in mines, even before James Watt developed the steam engine. With the advent of the modern industrial era, mining became the important basic industry and now the major portion of the metal supply is produced from large properties owned by big corporations. Likewise, modern



A PRIMITIVE GREEK MINE

From an archaic Corinthian plate

mining operations are conducted by highly skilled, technically trained men.

**Mining Methods.** The field of metal mining comprises the discovery of the metalliferous deposit, its development and the extraction and preliminary treatment of the ore. When an ORE DEPOSIT is discovered the first step is its exploration, by means of surface TRENCHING, DRILLING and shallow underground workings. A limited amount of work is done to gain a preliminary idea of the extent of the mineral deposit and its metal content, and to determine whether the property has sufficient merit to warrant larger expenditures. The results of this work being satisfactory, the mine has to be developed. Ore is blocked out, that is, through a series of underground workings a



**Ore Treatment.** Gold and silver ores are usually treated in a plant at the mine, where the precious metals are extracted by AMALGAMATION or the CYANIDE PROCESS. Most other metallic ores, excepting those of iron, are rarely rich enough to be treated directly, and they have to be concentrated in MILLS. The ore concentrates (*see* ORE TREATMENT) are then shipped from the mill, which is usually located at or near the mine, to a smelting plant.

**Present Day Tendencies.** With the rapid exhaustion of rich ore bodies, the tendency of metal mining is toward the working of low-grade deposits. What only a few decades ago would have been considered as waste, is now commercial ORE which can be profitably mined. Some copper mines yield as little as 15 lbs. of metal per ton of ore, and one profitable gold mine in Alaska contains only 60¢ worth of gold per ton. With low grade ore large tonnages must be worked to keep the unit cost of operations sufficiently low. One copper mine in the state of Utah has mined as much as 70,000 tons of ore in one day.

**Production.** The ever increasing demands of modern industry for raw materials has been met by the increased output of metal mines. The following table will show the growth of the metal industry in the last few decades:

WORLD'S PRODUCTION IN METRIC TONS

	1900	1910	1920	1930
Copper	491,435	877,494	982,351	1,587,569
Lead ..	870,846	1,093,043	913,212	1,664,465
Zinc	472,092	815,806	736,235	1,410,915
Iron .....	13,989,000	27,703,000	37,476,000	80,285,000
Tin .....	94,743	115,610	123,897	177,900
Nickel ....	8,730	22,140	30,300	51,570

In gold production, the Transvaal ranks first, producing about one half of the world's total, which, in 1930, was 20,460,168 oz. The United States came second, Canada third and Russia fourth. In 1931, Canada displaced the United States from the position of second largest producer of gold in the world.

The world's silver production was 245,780,030 oz. in 1930. In this, Mexico ranks first with 105,204,000 oz., the United States second with 50,234,000 oz., then Canada and Peru.

The United States produces about one half of the world's pig iron, the next in importance being Germany, France and Great Britain.

In copper production, the United States ranks first, yielding about 40% of the world's output; Chile is second, Africa third and Canada fourth. Africa's portion of the copper production in the near future will be greatly increased.

With lead, the sequence is: United States, Australia, Mexico, Canada, Spain and Germany; with zinc: United States, with about one third of the world's total, Belgium, Poland, Canada, Germany and France.

The important producers of tin ores are, in the order

named, Malay States, Bolivia, Dutch East India, Siam, China and Nigeria.

Up to 1904, New Caledonia was the largest producer of nickel. In that year, it was superseded by Canada, which now produces about 90% of the world's total.

Russia, until 1913, contributed over 90% of the world's platinum, but its present share is probably about 60%. The other important platinum producers are Colombia and Canada.

**Mining Laws.** In Europe, during the Middle Ages, the mineral wealth belonged exclusively to the sovereignty. The United States was the first country to give the discoverer of mineral on public lands private ownership of his find. This system was, in general, extended to Mexico and Central and South America after they became independent. Contrary to present mining laws in most other countries, in the United States private ownership of the soil carries with it ownership of the subsoil.

The throwing open of mineral resources to the prospector has been a great incentive in the search for minerals in America. The miner has been a pioneer, not only in finding metal deposits, but in extending the boundaries of civilization. Where important metal mines have been developed in remote districts, railroads and communities have eventually been established. The mineral wealth in western United States has perhaps been as great a factor in the settlement of the West as the free land which attracted the farmer. *See also* MINE EXPLORATION; MINE EXAMINATION; MINE DEVELOPMENT; PROSPECTING. B. L.

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**MINING, PLACER**, the removal of minerals from alluvial deposits by washing operations. The primitive way of working such ore deposits by shovel and pan is fast disappearing. Now, the excavation of the alluvial material is done by shoveling or more frequently, by power-drawn scrapers. To separate the valuable minerals the disintegrated gravel is passed through a series of boxes, called sluices, where the heavy, fine particles containing the values are caught in riffles, consisting of strips of wood or iron placed in the bottom of the sluice boxes. In hydraulic placer mining, water under pressure is used for excavation and transportation of the material to sluices. Dredges with excavating devices are suitable for river channels and large, flat gravel deposits. Drift mining is an underground method, applicable to deeply buried PLACERS, where the gold occurs in a definite stratum; access is by means of a shaft and the gravel bed is worked out in successive slices. The most important metals in placer deposits are gold, platinum and tin. *See also* MINING, METAL; MINING, HYDRAULIC. B. L.

**BIBLIOGRAPHY.**—G. J. Young, *Elements of Mining*, 1923.

**MINISTER** (Latin, a servant), in ecclesiastical usage a term applied to Christian clergymen in gen-

eral, but specifically to the Protestant clergy as "Ministers of the Gospel." The word was accepted by French-speaking Protestants for their clergy and is used in most Protestant bodies, but is not customary in the Catholic and Anglican Churches in this collective sense. In the early Church it designated deacons, or servants, in particular. Specifically, the general superiors of several religious Orders, e.g. Franciscans, Capuchins and Conventuals, are called ministers; the prior of La Grande Chartreuse is *ex officio* Minister-General of the Carthusians. The term "sacred ministers" refers to those clergymen, whatever their rank, who act as deacon and subdeacon at the celebration of High Mass. The term "minister" also applies to those who are authorized to administer the sacraments.

**MINK** (*Mustela vison*), a valuable fur-bearing animal of northern Europe and North America. Mink are water weasels 18 to 24 in. long, with tails about 7 in. Surprisingly large numbers of mink may be



EUROPEAN MINK  
*Putorius lutreola*

found in well-settled country, but always near water. They eat fish, frogs and crustaceans as well as small land animals. Mink are savage and fearless and seem to kill for the love of slaughter. They nest in burrows in stream banks and breed annually, producing from four to six young at birth. Mink fur is dark brown with a stripe of darker guard hairs down the back. The best dark pelts come from New York, New England and eastern Canada, many now being raised on farms. The short fur of the Alaskan and Russian mink is less valuable; Japanese mink is usually dyed.

**MINNEAPOLIS**, the chief city of the northern Mississippi Valley, a port of entry and the county seat of Hennepin Co., in Minnesota. It is situated on the Mississippi River, at the Falls of St. Anthony and at the head of navigation, immediately above and west of St. PAUL. Suburbs of both cities are contiguous on the east side of Minneapolis and the west side of St. Paul, and the two municipalities are popularly known as the "Twin Cities." Minneapolis is served by ten trunk railroads and numerous branch lines; also by traction, bus and truck lines and river barges. An airport provides direct air mail service to Chicago. The city records an average temperature of 12.7° F. in January, of 72.3° F. in July. The average annual precipitation is 27.66 in.

The city lies on a plateau overlooking both sides

of the Mississippi River. It has beautiful residential sections, with broad boulevards and an extensive park system, including Minnehaha Falls made famous in Longfellow's *Hiawatha*. This includes a number of lakes connected by canals, forming a scenic waterway 9 mi. long, for canoes and launches. There are many notable buildings and a large number of bridges crossing the Mississippi River; in one section the river is the boundary line between the two cities.

The immense water power from the Falls of St. Anthony and its extensive transportation facilities has made Minneapolis the distributing and manufacturing center of the Northwest. It is one of the country's primary wheat markets, due to its location in the wheat regions and its excellent water power and transportation facilities. Its chief industry is flour milling. Other important manufactures are butter and dairy products, linseed oil and cake, motor vehicles, knit goods and ornamental iron and foundry products. The total value of manufactures in 1929 was about \$361,000,000; the wholesalers proper distributed \$557,318,124 worth of merchandise in 1929, with grain, groceries, dairy products, farm machinery and hardware the principal items. The 6,028 retail stores, which did an aggregate business of \$304,330,792 that year, gave full-time employment to 29,710 people. Minneapolis is the seat of the University of Minnesota, De La Salle Institute and the MacPhail and Minneapolis schools of music.

Father LOUIS HENNEPIN, a Belgian missionary of the Franciscan Order, discovered the Falls of St. Anthony in 1680 and named them for the saint whose aid he had invoked at the outset of his expedition up the Mississippi. In 1805 Lieut. ZEBULON M. PIKE, in negotiating a treaty with the Sioux for the United States, obtained a strip of land including the greater part of the west side of the city. Ft. Snelling, to-day a Government military reservation, was built in 1819. The village of St. Anthony, on the east side of the river, was incorporated in 1855; Minneapolis, on the west side, was incorporated in 1856. There was great industrial rivalry between the two settlements, which finally united in 1872. Minneapolis began its growth as a sawmill and lumber town at the falls, but after about 1900, when the supply of lumber was becoming exhausted, flour milling, and later dairying, succeeded as major industries. Pop. 1920, 380,582; 1930, 464,356, making Minneapolis the 15th largest city of the United States.

**MINNEHAHA** ("Laughing Water"), in Longfellow's Indian poem, *Hiawatha*, daughter of an old arrow-maker of Dacotah and wife of HIAWATHA. She was named for a cascade in the Minnehaha River, a small stream in Minnesota emptying into the Mississippi.

**MINNEHAHA FALLS**, a picturesque waterfall of 60 ft. in a wooded glen within the limits of Minneapolis, Minn. It occurs on Minnehaha Creek, an outlet of Lake Minnetonka, which flows into the Mississippi River. The glen measures about 200 ft. at the top of the falls, the volume of which is now very



small due to dams on the creek. In former times there was a considerable cascade of great beauty, described in Longfellow's poem by the lines "Where the Falls of Minnehaha flash and gleam among the oak trees, Laugh and leap into the valley." The journey homeward of Hiawatha and Minnehaha is commemorated by a bronze group at the head of the falls.

**MINNESINGERS**, German lyric poets of the 12th and 13th centuries, akin to the *TROUBADOURS* of Provence. Generally men of noble birth, they sang almost exclusively of love (*minne*) and chivalry. The greatest poet of their school was Walther von der Vogelweide (1165-1230); and others of note were Dietmar von Aist, von Kürenberg, Frederick von Hausen, Heinrich von Morungen, Hartmann von Aue, Wolfram von Eschenbach and Ulrich von Lichtenstein. The Minnesingers were followed by the *MEISTERSINGERS*.

**MINNESOTA**, one of the north central states of the United States, popularly called the "Gopher State." It is situated between 43° 30' and 49° 24' N. lat. and 89° 29' and 97° 15' W. long. On the north it is bounded by the Canadian provinces of Manitoba and Ontario, being separated from the latter by Lake-of-the-Woods, Rainy Lake and Rainy River; on the east by Lake Superior and Wisconsin from which state it is separated by the Mississippi and the St. Croix rivers, on the south by Iowa and on the west by South Dakota and North Dakota, being separated from the latter by the Red River. Minnesota comprises an area of 84,682 sq. mi., inclusive of 3,824 sq. mi. of inland water surface. The state also has jurisdiction over 2,514 sq. mi. of water surface in Lake Superior. From north to south the extreme length of the state is 400 mi. and from east to west its extreme breadth is 380 mi. In size Minnesota ranks eleventh among the states of the Union.

**Surface Features.** Minnesota is a prairie state belonging to the central lowlands. Its surface is a broad plain, the topographic features of which are the result of glaciation and stream erosion. Extensive terminal moraines in the form of low knolls or gravel hills are distributed in rudely concentric systems which mark the successive positions of the ice sheet. In the many basins and kettle holes formed by these moraines are broad, shallow lakes. Red Lake, Mille Lacs, Leech, Winnibigoshish and Minnetonka are the largest of the 10,000 lakes attributed to Minnesota.

In the southwestern part of the state there is a hilly, elevated area known as the Coteau des Prairies, which rises to 1,900 ft. above sea level or 500 ft. above the general level. The northwestern section is as flat as a floor except for a series of low ridges which mark

the margin of ancient Lake Agassiz, now reduced to the Red River of the North.

The extreme northeastern part belongs structurally to the Laurentian Uplands of Canada. Its conspicuous features are the low ranges rising 500 to 900 ft. above the plain and running in a northeast-southwest direction, parallel to the northern shore of Lake Superior. Among them are the Vermillion and Mesabi ranges, the latter widely famous for its rich iron deposits.

The state as a whole has a mean elevation of 1,200 ft. above sea level. The Mesabi Range, 1,920 ft., is the highest point, and the level of Lake Superior, 602 ft., the lowest. A slightly elevated area in north central Minnesota constitutes the watershed separating three great drainage systems. The Mississippi River, rising in Lake Itasca, drains the southern two-thirds of the state into the Gulf of Mexico; the St. Louis River and other small streams drain the northeastern uplands into Lake Superior and thence to the St. Lawrence River; and the northern and northwestern areas are drained by the Rainy River and Red River of the North into Hudson Bay.

**Climate.** Lying in the geographical center of the continent, Minnesota is subject to great extremes of climate. The mean annual temperature is 40.9° F., ranging from 44.2° F. (with an average of 12.6° F. for January and 72.1° F. for July) at St. Paul to about 37° F. at points in the northeast. During the period 1886-1930, the highest temperature recorded in Minnesota was 114° F. and the lowest -59° F. The average annual precipitation is 25.1 in. including 38.9 in. of snow, decreasing from east to west. At St. Paul the average date of the last killing frost is April 26 and that of the first killing frost, October 10, giving an average growing season of 167 days.

**Forests and Parks.** Approximately three-fourths or 38,400,000 acres of the land area of Minnesota was originally forested. With the exception of the Red River Valley, the northern part of the state was a dense forest chiefly of white pine but also containing oak, maple, birch and poplar. The "Big Woods," a hardwood forest region, extended up the valley of the Minnesota River to the Big Bend on the western boundary of the state. All but very small and scattered areas have been cut over at least once. The timbered land, according to a 1931 estimate, is 22,000,000 acres. State owned forest lands totaled in 1929 1,038,279 acres; these include the state forests. The Chippewa National Forest in north central Minnesota and the Superior National Forest in the extreme northeastern portion are splendid coniferous timberlands with a total net area in June, 1930, of 1,073,213 acres. Minnesota was one of the first states to develop a state park system. ITASCA LAKE was established in 1891 and the creation of other parks from year to year has formed the nucleus of an outstanding system whose realization has, however, been seriously handicapped by insufficient appropriations. The majority of the 16 state parks as well as the state forests have been well developed for public recreation and are a mecca for tourists. The state also owns five



MINNESOTA STATE SEAL

state monuments, ranging in size from 1 to 12 acres, commemorating events in early Minnesota history and the Sioux uprisings.

**Minerals and Mining.** Minnesota owes its eminence as a mineral-producing state to its immense deposits of iron ore. The Mesabi, Vermillion and Cuyuna districts in the northern part of the state form the most important iron-producing region in the world, yielding from 1910 to 1930 more than half of the iron ore produced in the United States. In 1929 Minnesota produced 61% of the total United States output. All the other mineral products, chiefly granite, manganese ore, clay, sand and gravel, together comprise only about a tenth of the total output of the state.

With mineral productions in 1929 amounting to \$136,349,610, Minnesota stood tenth among the states, ranking first in iron ore and third in granite. The chief product, iron ore, 46,470,243 tons, was valued at \$121,776,312. Other important items in the output were stone, 517,720 tons valued at \$4,460,383, including granite, \$3,617,633, and limestone, \$815,027; manganese ore, 1,009,841 tons, \$2,531,072; sand and gravel, 4,990,256 tons, \$2,412,776; and clay products, \$2,085,697.

During 1929 172 mines and quarries gave employment to 12,918 persons who received \$21,406,083 in salaries and wages.

**Soil.** The soil of Minnesota, entirely of glacial origin, is on the whole remarkable for its fertility. In general it consists of a dark brown or black sandy loam with abundant lime derived from the underlying rock formations. This is excellent for wheat raising, especially in the southern counties and in the valley of the Red River. In the east central part of the state there is a more sandy, less fertile soil in which great crops of potatoes are grown. The Red Lake region contains many swampy areas which, by drainage, have yielded rich soils for crop production. In the northern areas where white pine was formerly lumbered, the light soils possess but little value except for reforestation. The surface of the comparatively small non-arable district in the northeast consists largely of coarse broken granite.

**Agriculture.** Minnesota ranks among the leading agricultural states; its principal crop products are corn, hay, oats, barley and potatoes.

In 1930 30,913,367 ac. or 59.7% of the entire land area was in farms, 185,255 in number, with an average size per farm of 166.9 ac. and an average value per acre of \$68.74. Of the farm area 19,490,692 ac. or 63% was crop land; 8,247,807 ac. or 27%, pasture land; and 1,090,143 ac. or 4%, woodland. The total value of farm property was \$2,608,749,608, of which \$2,125,093,278 was represented by land and buildings; \$181,767,478, by implements and machinery; and \$301,888,852, by domestic animals.

According to the census of 1930 Minnesota produced in 1929 field crops to the value of \$309,874,348, ranking fifth among the states. It stood first in barley, second in rye, flaxseed and hay, third in oats, sixth in corn and fourteenth in wheat; it also ranked second

in potatoes, eighth in sweet corn and ninth in sugar beets. The chief crop is grain valued at \$197,120,455. In 1929 oats were grown on 3,698,268 ac., with a yield of 126,221,063 bu. Of the 4,358,576 ac. devoted to corn, 2,862,645 ac. harvested for grain produced 104,419,048 bu. and 456,812 cut for silage yielded 3,364,490 tons. The acreage and yield of other grain crops were barley, 2,000,449 ac., 47,639,628 bu.; wheat, 1,314,757 ac., 19,760,092 bu.; rye, 411,594 ac., 6,642,976 bu., and flaxseed, 511,792 ac., 4,568,927 bu.

Of the hay crop of 5,549,722 tons valued at \$72,080,594, timothy and clover contributed 2,032,631 tons; wild grasses, 1,777,659 tons, and alfalfa, 1,366,578 tons.

Potatoes, grown on 329,598 ac., yielded 25,416,966 bu. valued at \$25,416,966. Other vegetables included sweet corn \$1,141,074, onions \$557,718 and cabbages \$485,761.

The chief fruits grown were apples, 905,409 bu.; raspberries, 3,228,724 qts., and strawberries, 2,427,897 qts.

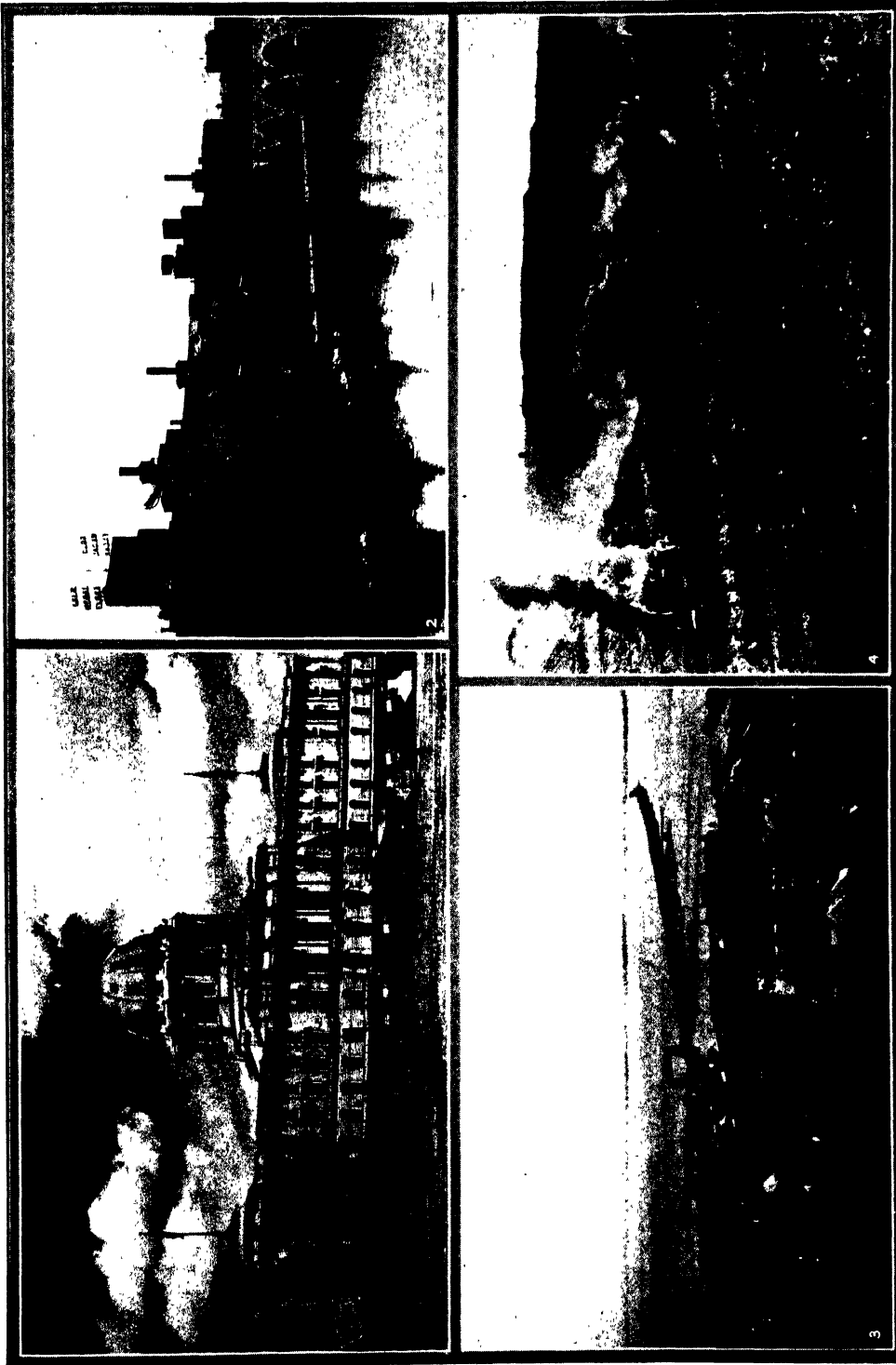
The sugar beet crop, 271,975 tons, was valued at \$1,887,517.

During the decade 1920-30 there was a marked increase in the use of modern machinery and other facilities. Automobiles rose from 107,820 in 1920 to 185,717 in 1930; motor trucks, from 3,803 to 36,557; and tractors from 14,503 to 48,457. Farm products sold by cooperative marketing rose from \$82,760,459 in 1919 to \$105,965,586 in 1929; farm supplies purchased by this method decreased from \$6,642,162 to \$6,414,232.

**Animal Industry.** Cattle-raising, chiefly for milk production, and hog-raising are the principal livestock interests. According to the census of 1930 the rank of Minnesota among the states was second in milk cows, third in horses, fifth in all cattle and sixth in swine; it stood second in milk produced, third in dairy products sold, eighth in chickens raised, and ninth in chicken eggs produced. The state ranked fourth in total value, \$301,888,852, of all domestic animals on farms. Among these were 3,165,178 cattle reported from 171,742 farms or 93% of all farms in the state and valued at \$172,966,826; also horses, 805,093 in number valued at \$64,346,928; mules, 15,218, \$1,270,966; swine, 3,315,466, \$43,493,674, and sheep, 927,098, \$6,964,895.

Of the cows on farms, 1,712,062 were kept mainly for milk production and 90,888 mainly for beef production. In 1929, 825,441,483 gals. of milk were produced; the total value of dairy products marketed was \$116,687,854, including \$96,018,988 for cream sold as butterfat. The value of all poultry grown amounted to \$25,660,576. The number and value of the chief kinds were chickens, 26,978,770, \$20,764,872; turkeys, 1,306,058, \$3,668,030; ducks, 723,967, \$626,543, and geese, 381,204, \$601,131. The chickens sold, 11,984,788 in number, were valued at \$9,488,566. Of 107,304,447 doz. chicken eggs produced, valued at \$28,987,407, 79,192,041 doz., valued at \$21,394,041, were marketed. The wool produced, 4,561,546 lbs., was

# MINNESOTA



1. COURTESY ST. PAUL ASSN.; 2. MINNEAPOLIS CIVIC AND COMMERCE ASSN.; 3. L. P. GALLAGHER, COURTESY CHAMBER OF COMMERCE, DULUTH; 4. TEN THOUSAND LAKES ASSN.

## INDUSTRIAL AND GOVERNMENTAL SCENES IN MINNESOTA

1. The State Capitol at St. Paul, designed by Cass Gilbert and completed in 1905.
2. Flour milling district in Minneapolis, the greatest in the world.
3. The city of Duluth on Lake Superior, head of navigation of the Great Lakes.
4. An open pit mine near Hibbing, in the center of the iron deposits of the Mesabi Range.





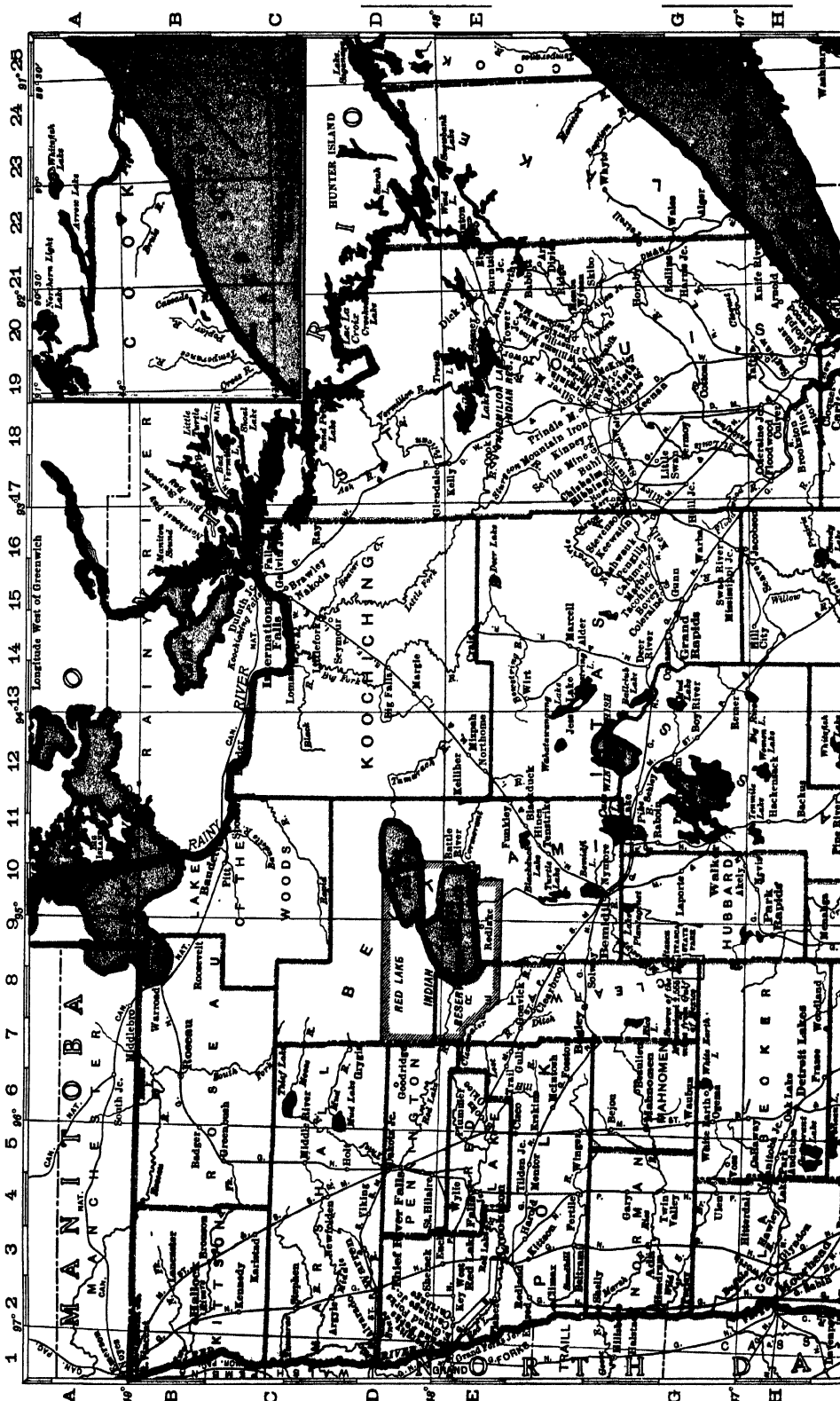
# MINNESOTA

Area 84,682 sq. m.  
Pop. 2,563,983

## PRINCIPAL CITIES

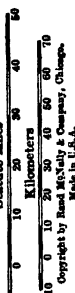
### Pop.—Thousands

- 10 Albert Lea R 15
- 4 Alexandria K 7
- 5 Anoka M 15
- 12 Austin R 17
- 3 Bayport N 18
- 7 Bemidji F 9
- 8 Blue Earth E 13
- 10 Brainerd J 12
- 8 Chisholm F 17
- 7 Cloquet I 19
- 6 Columbia Heights M 23
- 6 Crookston E 3
- 8 Crosby I 13
- 4 Detroit Lakes H 6
- 102 Duluth H 21
- 3 East Grand Forks E 1
- 3 Edina N 22
- 6 Ely E 21
- 8 Eveleth F 19
- 6 Fairmount R 11
- 13 Faribault P 16
- 9 Fergus Falls J 6
- 3 Gilbert F 19
- 2 Glencoe N 12
- 2 Glenwood L 7
- 3 Grand Rapids G 15
- 2 Granite Falls N 7
- 5 Hastings O 18
- 16 Hibbing F 17
- 4 Hopkins N 11
- 3 Hutchinson N 11
- 5 International Falls C 15
- 2 Jackson R 9
- 2 Keewauwin G 17
- 3 Lake City O 19
- 2 Le Center O 13
- 3 Litchfield M 11
- 5 Little Falls K 12
- 3 Luverne R 4
- 2 Madison P 14
- 14 Mankato P 13
- 3 Marshall O 8
- 2 Melrose L 10
- 464 Minneapolis N 16
- 4 Montevideo N 6
- 3 Moorhead H 12
- 3 Morris L 5
- 2 Naahwauk G 16
- 2 New Prague O 15
- 7 New Ulm N 11
- 4 Northfield O 16
- 3 N. Mankato P 13
- 3 North St. Paul M 25
- 2 Ortonville M 3
- 3 Owatonna P 13
- 2 Park Rapids H 9
- 2 Perham I 7
- 4 Pipestone O 3
- 2 Princeton L 15
- 3 Proctor (Proctor Fork) O 20
- 10 Red Wing O 19
- 3 Redwood Falls O 8
- 3 Richfield N 23
- 4 Robbinsdale M 22
- 21 Rochester O 19
- 21 St. Cloud L 12
- 3 St. James O 10
- 5 St. Louis Park M 22
- 273 St. Paul N 24
- 5 St. Peter P 13
- 3 Sauk Center L 9
- 3 Sauk Rapids L 12
- 2 Shakopee N 15
- 3 Sleepy Eye L 10
- 10 South St. Paul N 17
- 2 Springfield P 9
- 3 Staples J 10
- 7 Stillwater N 18
- 4 Thief River Falls D 4
- 3 Tracy P 6
- 4 Two Harbors H 22
- 12 Virginia F 19
- 2 Wabasha P 11
- 3 Wadena P 18
- 2 Warren D 2
- 4 Waseca O 15
- 3 Wells O 14
- 5 W. St. Louis N 25
- 3 White Bear Lake M 25
- 6 Willmar M 9
- 3 Winnebago Q 12
- 21 Winona Q 23
- 4 Worthington R 6

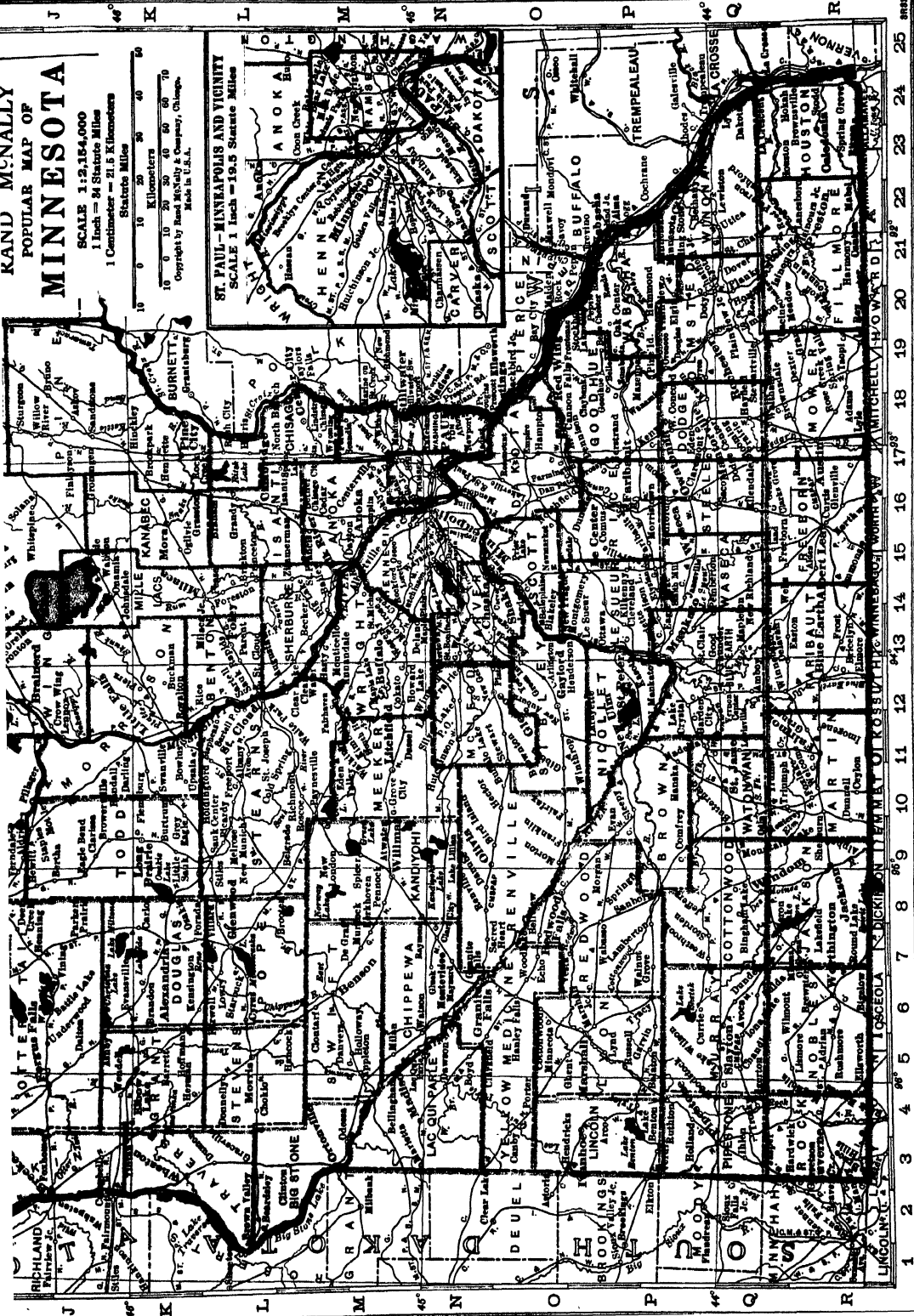
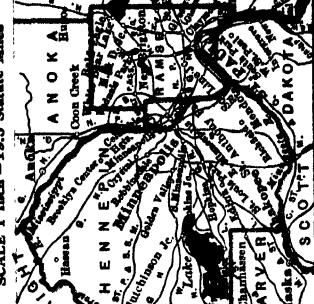


KAND MCNALLY  
POPULAR MAP OF  
MINNESOTA

SCALE 1:2,154,000  
1 inch = 84 Statute Miles  
1 Centimeter = 21.3 Kilometers



ST. PAUL-MINNEAPOLIS AND VICINITY  
SCALE 1 inch = 19.5 Statute Miles



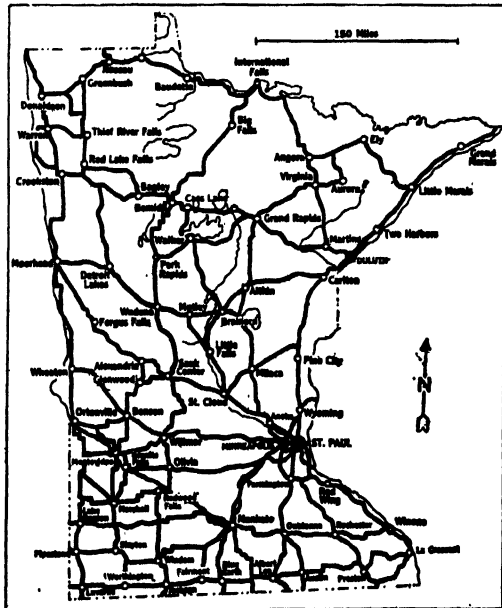




valued at \$1,351,927. Honey, reaching a total of 3,136,481 lbs., valued at \$414,768, was produced from 59,330 hives.

**Fisheries.** In 1930 the total commercial fish catch amounted to 16,742,000 lbs., valued at \$726,000. There are fisheries both on Lake Superior and in the Mississippi River. Lake species taken include buffalo fish, carp, catfish and crappie. The thousands of inland lakes are known to sportsmen throughout the world for their wonderfully fine fishing. Minnesota has a wise conservation program, and in 1930 issued 397,257 fishing licenses to sportsmen who paid \$366,418 in fees. Twelve state hatcheries are operated, which employed 29 men in 1930. The total cost of fish propagation during the year amounted to \$100,340. From these hatcheries 5,844,070 trout, 168,364 bass and 468,876,899 commercial species were planted in state waters.

The United States Bureau of Fisheries made heavy plantings of fingerlings and yearlings during the same year, including 4,614,841 catfish, 195,000 whitefish, 131,000 rainbow trout, 151,500 loch leven trout, 91,000 lake trout, 258,500 brook trout, 3,453,665 crappie, 7,703,286 sunfish, 5,875,000 pike perch, 1,905,825 yellow perch and 5,778,000 other species. At the time of the annual overflow of the Mississippi River, 22,225,795 fish were rescued and returned to the river by the Bureau's sub-station at Homer. These were largely catfish, sunfish, carp and crappie.



MINNESOTA STATE ROADS

**Transportation.** Minnesota has adequate transportation facilities both by land and water. Duluth, at the terminus of the Great Lakes waterway system, is one of the most important ports in the United States, shipping grain and ore and receiving coal and other

commodities for the northwest. The Mississippi River, formerly an important transportation artery between Minneapolis, St. Paul and St. Louis, has been practically superseded by the railroads. Its availability, however, tends to reduce freight rates on the north-south lines which follow its course. An intersecting network of steam railroads with a total mileage of 8,816 in 1930 penetrates the state's grain and ore regions. The principal systems include the Great Northern, Northern Pacific, Milwaukee, Chicago & Northwestern, Chicago Great Western and Minneapolis & St. Louis.

The state highway system is well maintained and had a total mileage of 146,054 on Jan. 1, 1930, including 35,501 mi. of surfaced roads and 6,723 mi. of improved state highways. Highway expenditures during 1929 were \$43,247,175, of which \$19,740,618 was paid by the state and \$23,506,557 by county and local governments. The state gasoline tax produced an income of \$10,359,111 in 1930, as against \$4,804,688 in 1926. Motor vehicle registrations were 732,972 in 1930 compared with 56,969 in 1925. The rapid growth of transportation by truck is indicated by registrations, which increased from 44,815 in 1925 to 108,070 in 1930, about 144%. During the same period, the number of buses in operation increased from 930 to 1,978, or over 112%.

**Manufactures.** Minnesota has important manufacturing industries, based chiefly on the utilization of its extensive agricultural, livestock and forest productions. Abundant waterpower, especially at Minneapolis, greatly aided the earlier industrial development and since 1910 there has been a great expansion in the production of electric power.

According to the census of 1930 Minnesota with manufactures for 1929 valued at \$1,173,213,606 stood fifteenth among the states. Its 4,315 establishments gave employment to 20,817 officers and employees, who received \$47,724,098 in salaries, and to 103,414 wage earners, who were paid \$132,418,195 in wages. These factories used a total of 606,704 horse power, expended \$26,662,603 for fuel and power, and \$741,555,726 for materials and supplies, and added by the process of manufacture \$404,995,277 to the value of their output.

This output included 106 separately enumerated manufactures, the state leading all others in the production of flour and butter and ranking third in wood preserving, sixth in meat packing and tenth in wood pulp. The outstanding products were packed meats valued at \$201,155,942; flour, \$158,963,156, and butter, \$128,704,989, which comprised 41% of the state's total manufactures. Other important manufactures in order of value were printing and publishing, \$52,785,973; foundry and machine shop products, \$37,411,520; steam railway carshop construction and repair, \$35,839,054; linseed oil, cake and meal, \$28,611,825; bread and bakery products, \$26,581,658; paper, \$21,604,107, and wood preserving, \$16,329,511.

The principal manufacturing cities were Minneapolis and St. Paul with products valued at \$361,

075,199 and \$206,918,164 respectively, amounting to 48% of the entire output of the state. Next in importance were Duluth with an output of \$58,903,568, and Winona, \$21,762,851.

**Commerce.** According to the census of 1930, there were in 1929 5,521 wholesaling establishments in Minnesota, with total sales of \$1,716,943,734. This volume represented 2.47% of the wholesale trade of the United States, and was exceeded in only nine states. These wholesalers gave full-time employment to 37,498 men and women, whose annual salaries aggregated \$62,332,561. Minneapolis, the chief wholesaling center, reported sales of \$848,931,323, about half the volume for the entire state. St. Paul and Duluth were also important.

The total sales of the 30,977 retail stores amounted to \$1,071,787,582. Sales per store averaged \$31,027; sales per capita were \$418.02.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
General Mdse. ....	3,241	\$248,747,599	23.21
Automotive .....	5,944	220,448,432	20.55
Food .....	7,833	202,796,963	18.92
Lumber & Bldg. ....	2,616	85,744,584	8.01
Apparel .....	2,162	77,481,490	7.22
Furn. & Household ..	900	37,150,633	3.46
All other stores .....	8,281	199,417,881	18.63

Total, all stores ... 30,977    \$1,071,787,582    100.00

Duluth, the principal port, handled water-borne commerce amounting to 60,385,767 tons, with a value of \$485,631,945. Iron, coal, wheat and limestone are the most important products.

**Finance and Banking.** The assessed value of all taxable property in 1930 was \$1,939,006,464. The total bonded debt was \$95,650,583, less \$6,003,535 in sinking funds. Total state revenues in 1930 were \$95,298,869. The chief sources of income were taxes from counties, \$10,947,925, taxes on corporation gross earnings, \$11,079,884, motor vehicle taxes, \$11,224,017, and gasoline taxes, \$9,500,348. Total disbursements were \$90,981,902. The principal payments were for trunk highways, \$17,259,401, universities, \$7,469,390, school aid, \$6,089,292, Federal highway reimbursement, \$4,313,832, and charities, \$4,513,736.

There were 982 banks in Minnesota in 1930. Of these 251 were national banks and 731 trust companies and state banks. Their total capitalization was \$67,411,254; their surplus and undivided profits, \$49,693,000. Total resources were \$1,118,257,000, with loan and discounts aggregating \$505,249,000. Demand and time deposits totaled \$879,312,000. Per capita demand and time deposits were \$342.01; per capita savings deposits, \$191.35. The total savings of \$491,963,000 were owned by 975,756 depositors. National bank circulation aggregated \$13,947,000.

**Government.** The legislative power of the state is vested in a senate composed of 67 members and a house of representatives of 131 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions

limited in duration to 90 days. A governor, lieutenant governor, secretary of state, auditor, treasurer, and attorney-general make up the executive branch of government. The governor is elected for a term of two years at a salary of \$7,000 a year. Judicial powers are vested in a supreme court, in district courts, courts of probate and justices of the peace. The supreme court consists of five judges elected for terms of six years at salaries of \$7,000 per annum.

**Social Welfare Institutions.** The State Board of Control supervises all charitable and corrective institutions. There is a training school for boys at Red Wing and a home school for girls at Sauk Center. At Faribault are schools for deaf, blind, and feeble-minded. A colony for epileptics is at Cambridge. State hospitals are located at Rochester, St. Peter and Fergus Falls, the last named having psychopathic, tuberculosis, contagious disease and occupational departments. The state asylums for insane are at Anoka, Willmar and Hastings. A reformatory for women is at Shakopee and for male first offenders at St. Cloud. Gillette Hospital for Crippled Children is at St. Paul and a sanitarium for consumptives at Ah-Gwah-Ching. The state has a public school at Owatonna for neglected and ill-treated normal children under 15 years of age. The state prison is at Stillwater.

**Education.** The first schools were mission schools for Indians established in 1834. The first school for white children was opened at St. Paul in 1847. The territorial legislature at its first convention in 1849 enacted the first school law, and by 1860, grade schools were established in Minneapolis, then St. Anthony. In 1928-29, the 7,759 public elementary school districts had 22,199 teachers and 553,336 pupils. In the 541 high schools there were 6,440 teachers and 119,060 pupils. Children from 8 to 16 years of age are required to attend school the full term.

The number of persons from 5 to 20 years of age attending school in 1930 was 589,607, or 74.2% of the population within the ages specified, as compared to 498,138, or 66.9%, in 1920. Persons 10 years and over unable to read and write in 1930 numbered 26,302, or 1.3%, as compared to 34,487 illiterates, or 1.8%, in 1920.

The state institutions of higher learning include the University of Minnesota at Minneapolis; and 6 teachers' colleges located at Bemidji, Duluth, Mankato, Moorhead, St. Cloud and Winona. Among other institutions of collegiate rank are Hamline University and Macalester College, both at St. Paul; St. John's University at Collegeville; and Carleton College and St. Olaf College, both at Northfield. The Library Division, State Department of Education, has headquarters in the Historical Building at St. Paul.

**Population.** In 1930 Minnesota ranked eighteenth among the states with a population of 2,563,953 or an average of 31.7 per sq. mi., an increase of 176,828 or 7.4% over 1920. The population rose from 6,077 in 1850 to 1,751,394 in 1900, 2,075,708 in 1910 and to 2,387,125 in 1920. In 1930 there were 2,538,973

or 99% whites, 11,077 or 0.4% Indians and 9,445 or 0.4% Negroes. Of the whites 2,150,679 were native born and 388,294, foreign born. Of the total foreign stock including foreign born, foreign and mixed parentage, 538,685 or 37% were Norwegian and 327,785 or 23.0%, German. The rural population was 1,306,337 or 51% of the total, a decrease of 29,195 or 2.2% from 1920; the urban population was 1,257,616 or 49% of the total, an increase of 206,023 or 19.6% since 1920. In 1930 the six largest cities were Minneapolis, 464,356; St. Paul, 271,606; Duluth, 101,463; St. Cloud, 21,000; Winona, 20,850; Rochester, 20,621.

**Occupations.** In 1930 992,798 persons, or 38.7% of the population, were gainful workers 10 years old or older; 79.8% of these were males and 20.2% were females; 78.7% were native white, 20.4% foreign-born white, and 0.5% Negro. Among the principal occupations, with number of workers, were farmers, 183,714 and farm wage workers, 77,389; salespersons, 31,648 men and 12,999 women; clerks, 27,358 men and 16,730 women; factory operatives, 29,429 men and 13,114 women; servants, 5,506 men and 33,689 women; retail dealers, 31,137 men and 1,670 women; school teachers, 3,651 men and 23,323 women; factory laborers, 20,501 men and 1,125 women; stenographers, 709 men and 17,717 women; carpenters, 17,658; chauffeurs, 16,405, and bookkeepers and cashiers, 6,120 men and 9,509 women.

### HISTORY

RADISSON and GROSEILLERS are known to have reached Minnesota between 1655 and 1659, and to have made treaties with the Dakotas and Chippewas, who inhabited respectively the southern, or open, and northern, or wooded, sections of the State. Du Lhut set up the standard of Louis XIV at Mille Lacs in 1679; HENNEPIN discovered the Falls of St. Anthony in 1680; Nicholas Perrot, trader, established himself on the eastern shore of Lake Pepin in 1686; in 1695 Pierre le Sueur founded a trading post on Prairie Island between Hastings and Red Wing and in 1700 a post on the site of Mankato. None of these settlements was permanent. Ft. St. Charles, on the Lake of the Woods, founded by La Verendrye in 1732, was occupied for 20 years, longer than any other French establishment in Minnesota. French possessions east of the Mississippi were ceded to Spain in 1762; England obtained the eastern possessions in 1763. Fur trading operations were carried on by men of both nations. After the REVOLUTIONARY WAR the English-owned part of Minnesota was nominally relinquished to the United States; but the British dominated the fur trade until after the WAR OF 1812, when the American Fur Company invaded the region. By the LOUISIANA PURCHASE, 1803, the United States gained title to the whole of Minnesota. In 1805-1806 PIRE explored the Mississippi as far as Leech Lake and Cass Lake. Ft. Snelling, first called Ft. St. Anthony, was built and garrisoned in 1819. Maj. Stephen S. Long conducted elaborate explorations of the Minnesota and Red

River valleys in 1823, and in the same year Beltrami, an Italian visitor, explored the country between the Red River and the Mississippi. (See RED RIVER SETTLEMENT.) Reports of explorations, the expansion of the fur trade, and the beginning of lumbering operations directed attention to Minnesota. Following treaties with the Indians in 1837 which extinguished the aborigines' title to the land between the Mississippi and St. Croix rivers, settlements at St. Paul and Stillwater developed; a small settlement at Mendota, opposite Ft. Snelling, antedated these. The Territory of Minnesota was created in 1849, with St. Paul as capital. The federal census of 1850 reported 6,077 inhabitants in the region, most of them east of the Mississippi or along the Red River in the northwest. Treaties with the Sioux in 1851 and with the Chippewas in 1854 and 1855, although negotiated largely in the interests of lumbermen, in clearing the title to the greater part of the state, permitted an unparalleled rush of immigration. In 1857 the territory had a population of 150,037, and on May 11, 1858, was admitted as a state.

Minnesota during the CIVIL WAR was harassed by Indian outbreaks. Gen. Henry Sibley, first governor of the state, captured and executed the leading chieftains, and drove the survivors beyond the Missouri. At the close of the war Scandinavians came into the state in even greater numbers than the Germans had come in the 1850's. The central and western portions of the state were soon given over to agriculture. St. Paul became the wholesale market of the Northwest when the northern transcontinental railways were built, and Minneapolis became the center of the milling industry. Later phases of economic development were exploitation of the mineral wealth of the northern ranges and the shift from concentration on wheat to diversified farming and dairying. In 1930 Minnesota and the Federal Government reached a basis of cooperation for preservation of water courses in the Canadian border area. Although a Republican stronghold in many national elections, in 1932 the state gave its 11 electoral votes to Roosevelt. Floyd B. Olson, the Farmer-Labor candidate, was reelected governor.

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**MINNESOTA, UNIVERSITY OF**, at Minneapolis, Minn., a coeducational state university, was chartered in 1851 and opened as a school, preparatory in scope. It was reorganized in 1868 to begin collegiate work. With the lands it received under the Federal Land Grant Act, the university established a school of agriculture and organized other schools and colleges. It maintains a College of Science, Literature and Arts, College of Engineering and Architecture, School of Chemistry, Department of Agriculture, Law School, Medical School, College of Dentistry, School of Mines, College of Pharmacy, College of Education, Graduate School, School of Business and Extension Service. The agricultural experiment station is con-

ducted in cooperation with the Federal Government. The Mayo foundation for medical education and research works in conjunction with the Mayo Clinic at Rochester, Minn. The productive funds in 1931 amounted to \$7,654,579. The library contained 525,000 volumes. In 1930 there was a student enrollment of 14,010, and a faculty of 615 headed by Chancellor LOTUS DELTA COFFMAN.

**MINNESOTA RIVER**, a river of southern Minnesota, rising in Marshall Co., South Dakota, on the eastern slope of the Dakota foothills. It flows southeastward to the boundary line between South Dakota and Minnesota, where it enters Big Stone Lake, a shallow body of water 26 mi. long. The river issues from the southern end of this lake, flows southeastward through Minnesota to Mankato, from which point its course changes to northeast. It enters the Mississippi River midway between Minneapolis and St. Paul. Throughout most of its course of 475 mi. the Minnesota flows through bottom lands of a breadth entirely out of proportion to the size of the stream, indicating the existence of a much larger river in former times; in modern times the upper reach of the river often runs dry. It has an average slope of 1.1 ft. per mi. and its drainage basin of about 16,000 sq. mi. consists of fertile, undulating country diversified by many small lakes. It is fed from the north by the Pomme de Terre and Chipewa; from the south by the Lac qui Parle, Redwood, Cottonwood and Blue Earth.

**MINNOW**, the name applied to numerous very small fishes comprising the greater part of the CARP family (*Cyprinidae*). They are mostly tiny, feeble fishes, 2 to 5 or rarely 8 in. long, abounding in fresh waters in temperate and tropical regions. Upwards of 200 species occur in North America, many of which, especially the larger forms, are called also DACE and SHINER. Minnows are especially abundant in all streams east of the Rockies, constituting a characteristic feature of the aquatic fauna of the eastern United States. In these waters they form a large share of the food of predatory fishes. Minnows spawn profusely and find everywhere an abundance of plant and animal food, often devouring the eggs of larger fishes. On the whole the group is of slight economic importance, though various minnows are widely used for bait.

**MINOR**, in music, a word qualifying intervals and modes. With reference to the scale it signifies that mode, or scale construction, based on the use of the minor third above the keynote instead of the larger or major third in the major mode. The minor sixth and minor seventh are also characteristic intervals in the minor mode, although they do not appear invariably, being used only in the HARMONIC MINOR SCALE and in the descending form of the MELODIC MINOR SCALE.

In Greek music (*see* MUSIC: Greek) and JUST INTONATION, an interval known as a TONE is called minor to distinguish it from another interval, slightly larger, called major. The interval from D to E is

a minor tone, in these systems of tuning, whereas the interval from C to D is a major tone. The ratio expressing the minor tone is 10:9; that is, in terms of vibration frequency, E:D::10:9.

**MINORCA** or **MENORCA**, a Spanish island of the Mediterranean, and the second largest of the BALEARIC ISLANDS. It is located about 25 mi. north-east of Majorca; and covers an area of about 260 sq. mi. The irregular coastline is particularly jagged in the north, and the surface is varied by valleys and elevations. Sheep, goats and other cattle are bred in Minorca, which also makes woolen and linen cloth. Many varieties of fruit are produced, especially grapes, almonds, pomegranates, figs, melons and olives. The chief town is Port Mahon. Est. pop. 1929, 18,000.

**MINORITY**, a term technically meaning less than one half. It may be used to refer to the lesser political parties, or to dissident groups of a religious or nationalistic character. The problem of safeguarding the rights of minorities constitutes one of the fundamental problems of politics.

At various times the powers of Europe have sought by international guarantee to safeguard the racial, linguistic, or religious minorities of new or relatively backward states. After the World War the application of this principle of international protection was extended. The new states and certain of those receiving accessions of territory were required to sign minorities treaties with the principal allied and associated powers designed to insure their respective minorities against discriminatory treatment. The treaties are placed under the guarantee of the LEAGUE OF NATIONS.

F. M. R.

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**MINOS**, in Greek mythology, the name of two kings of Crete. Minos I, son of ZEUS and EUROPA, was such a wise and just ruler that when he died the gods made him a judge in Hades. Minos II, grandson of Minos I, was husband of Pasiphae and father of ARIADNE. His son Androgeos was killed by the Athenians, and as a penalty Minos demanded from them a yearly tribute of seven maidens and seven youths to be fed to the MINOTAUR.

**MINOT**, a city in northern North Dakota, the county seat of Ward Co., situated on the Mouse River, 110 mi. west of Devil's Lake. It is served by two railroads. Minot is a wheat, dairy and farm products market, and a wholesale and jobbing distributing center. The retail business in 1929 amounted to \$16,166,916. Near by is an enormous strip lignite coal mine. The city has a fine park system and is the seat of a State Teachers College. Minot was settled in 1886; incorporated in 1887. Pop. 1920, 10,476; 1930, 16,099.

**MINOTAUR**, in Greek mythology, a monster, half man and half bull, offspring of Pasiphae, wife of MINOS II, and the bull sent by POSEIDON to destroy the land. The minotaur was kept by Minos in a labyrinth and fed on the flesh of the youths and maidens sent as yearly tribute from Athens. THESEUS finally killed the monster with the help of ARIADNE,

the king's daughter, who gave him the thread which led him safely out of the labyrinth.

**MINSK**, the capital and largest commercial, industrial and cultural city in the White Russian S.S.R., located on the Svislotch River, near the Polish border. Since its founding in the 11th century, its geographical position has exposed it to the invasions of many Slavic tribes, Tatars, Swedes, the French under Napoleon, and Germans in the disturbances following



THESEUS SLAYING THE MINOTAUR  
From an Attic amphora in the Louvre

the 1917 revolutions. The city is abundantly endowed with educational institutions, among them the State Museum, State University, Communist University, the Institute for White Russian Culture and numerous experimental schools. The Roman Catholic cathedral, built in 1650, and the 18th century clock tower are interesting architectural features. Under the czar Minsk was a military center. It has factories producing chiefly machines, bristles, leather goods and paper. Jews make up 44% of the population, with White Russians as the next largest element. Pop. 1926, 131,528.

**MINSTREL**, a term applied in the 13th century to a household entertainer; later applied to a poet, musician, juggler, or the like—often a man of noble birth—who either wandered from court to court or was permanently retained by a nobleman or a royal person. After about the 15th century, minstrels degenerated into mere wandering players. In America, a minstrel is a Negro or "blackface" entertainer who sings, dances, tells funny stories, etc., either alone or in company with from 15 to 40 other minstrels in a "minstrel show" or "minstrels." The first American minstrel was Thomas D. Rice (1808-60), and the first company was the Virginia Minstrels, 1843.

**MINT**. The Bureau of the Mint is the administrative division of the UNITED STATES TREASURY DEPARTMENT charged with the supervision of the several government mints and assay offices located as follows: The mints, at Philadelphia, Pa., San Francisco, Cal., Denver, Colo., New Orleans, La., and Carson City, Nevada; the assay offices, at New York City, Boise, Idaho, Helena, Mont., Seattle, Wash., and Salt Lake City, Utah. These institutions are required to receive any deposits of GOLD offered and to pay in return the equivalent value, less charges, at mint par-

ity in United States gold coin or other accepted form of payment. SILVER, NICKEL and COPPER are purchased at market prices as needed.

The primary function of the mints is to manufacture United States coin, and of the assay offices to assay the metals. Refining by the electrolytic process is conducted at New York, Denver, and San Francisco. Bullion bars, primarily for export, and small bars, primarily for trade use, are manufactured both of gold and silver. The mints also manufacture memorial coins and medals when so authorized by Congress and accept contracts from foreign governments for the minting of coins. Valuable monetary statistics covering practically all countries of the world are compiled and published. O. L. M.

**MINT**, a general name given to numerous aromatic herbs of the mint family, as the HORSE MINT (*Monarda* sp.), MOUNTAIN MINT (*Pycnanthemum* sp.), cat mint (*Nepeta* sp.), and especially to the true mints (*Mentha* sp.) including the PEPPERMINT and SPEARMINT. They owe their aromatic properties to the presence of various essential oils.

**MINTO, WILLIAM** (1845-93), British author and critic, was born at Alford, Scotland, Oct. 10, 1845, and educated at Aberdeen University. He served as editor of the London *Examiner* in 1874-78, and in 1881 was appointed Professor of Logic and English Literature at Aberdeen. He wrote three novels, but is best known as a critic. His works include *Manual of English Prose Literature*, *Biographical and Critical*, *Daniel Defoe* and *English Literature under the Georges*. Minto died at Aberdeen, Mar. 1, 1893.

**MINT PAR OF EXCHANGE**, the ratio of one country's standard monetary unit to that of another country on the same metallic basis; the bullion value of the monetary unit of one country expressed in terms of that of another nation. GOLD and SILVER are commodities of international commerce similar in all ways to other commodities. Mint par is determined for a given nation by dividing the weight of pure gold contained in its standard monetary unit into the weight of pure gold contained in the standard coin or monetary unit of another, the value of the alloy being disregarded. A standard coin has the same value in the form of bullion as it has in the form of money. A standard coin is therefore exportable. The standard gold coins of two nations equal two different quantities of the same metal. The mint par of exchange of the pound sterling with the United States dollar is \$4.8665, meaning there is 4.8665 times as much pure gold by weight in the pound sterling as in the United States gold dollar. The same formula may be used to determine the par of exchange between two silver standard countries.

**MINT PRICE OF GOLD**, the fixed amount which the assay offices and mints are required by statute to pay for any given weight of gold of standard, 9/10 fine or other fineness. The statutes declare that the value of 23.22 grains of pure gold, or 25.8 grains of standard gold, shall constitute the DOLLAR. Since 23.22 grains of pure gold is equal to one dollar,

the assay office will receive and pay for pure gold at the rate of \$20.67 per ounce. The mint price per ounce of British standard gold bullion, 11/12 fine is £3 7s 10½d. The Bank of England is required by law to pay £3 7s 9d an ounce for standard gold, this being 1½d less than the actual mint price (*see* SEIGNIORAGE). Payment is made in notes or gold coin.

**MINUET**, a stately dance in triple meter, which originated in France about 1650. A great favorite in the court of Louis XIV, it presently acquired equal popularity in England. Taken over as a movement in the SUITE, it passed into the SONATA of Haydn and Mozart during the 18th century. Although Beethoven occasionally made use of it, he more often substituted a SCHERZO which is sometimes said to have developed from the minuet despite the fact that the two movements have naught in common but a triple meter and a middle section both bearing the name of trio.

**MINUTE**, a unit of time equal to 1/60 hour; also a unit of angular measurement equal to 1/60 degree. *See* WEIGHTS AND MEASURES.

**MINUTE MEN**, the provincial militia of Massachusetts organized in 1774-75 under the direction of the Committee of Safety, and so called because they were supposed to be ready to take the field at a minute's notice. The Minute Men participated in the first battles of the Revolution. *See* LEXINGTON, BATTLE OF; CONCORD, BATTLE OF.

**MIOCENE EPOCH**, the third subdivision of the Tertiary Period of the CENOZOIC ERA in geological history.

**MIQUELON**, two islands known as Great Miquelon and Little Miquelon. *See* ST. PIERRE AND MIQUELON ISLANDS.

**MIRA** (*Omicron Ceti*), a star in the constellation CETUS and the first variable star to be discovered; hence its name, the miraculous. Its brightness varies periodically from the third to the ninth magnitude in about 330 days. At maximum light, when it is deep red in color, its diameter is about 300 times larger, its luminosity more than 100 times greater than that of the sun. Mira is accompanied by a faint, white star of the tenth magnitude, considerably fainter than the sun, a WHITE DWARF. The mutual separation of these stars is some 5 to 10 billion miles, their distance from the earth probably 160 light years. *See* STAR: *map*.

**MIRABEAU, GABRIEL HONORÉ RIQUETI, COUNT DE** (1749-91), French statesman and brilliant orator, was born at Bignon, near Nemours, Mar. 9, 1749. His early years were spent in fantastic extravagance and excess during which he was three times imprisoned, once at his father's request and again held in semi-exile by his family. He published many pamphlets and articles, one in 1782 of a political nature entitled *Lettres de Cachet*, attracted much attention. A vigorous and penetrating attack on certain abuses of the criminal law of the ancient régime, it made him a marked man feared and hated

by the Court. When the States-General was called in 1789 he sought election as representative of the aristocracy but was refused. He then turned to the Third Estate of Aix and was elected as their deputy. His political genius greatly influenced the early phase of the Revolution. By far the ablest member of the Constituent Assembly he advocated many of the great reforms made by that body and aided in framing the Constitution of 1791. He was made president of the Jacobin Club in 1790 and in 1791 served as president of the National Assembly, for the successful organization of which he had been largely responsible. His efforts to support the monarchy after helping to limit its powers were frustrated by the weakness of Louis XVI and by his own unfortunate dissipations. He died at Paris, Apr. 2, 1791.

**MIRACLE**, a word derived from the Latin, meaning an event that arouses wonder. A miracle is thus defined as an occurrence which cannot be explained by natural causes within our knowledge. When, according to the records, Jesus multiplied the loaves and fishes, walked on the Sea of Galilee, or changed water into wine, he worked such a miracle. The most frequent miracles consist of healing the sick without the use of the usual material agencies. In Mark 16:17, it is stated that Jesus granted a power of miracle in the final commission to his disciples, and in I Corinthians 12:28, St. Paul included miracles among the "spiritual gifts," with which the Church is endowed. In ecclesiastical tradition are accounts of innumerable miracles, some of them as picturesque as they are credible. CHRISTIAN SCIENCE embraces a spiritual healing which according to material reasoning, is miraculous, and a similar phenomenon in the traditional churches, Protestant as well as Catholic, is sometimes described as faith healing. In Roman Catholic procedure, no person can be beatified unless it is proved that his piety has included the power to work miracles, and in the subsequent process by which a beatified person is canonized as a Saint, it must be shown that by his intercession, miracles, usually two in number, have been granted. Pilgrimage to shrines of healing like Lourdes in France is based upon a belief in miracles.

Rationalist criticism has been sceptical of miracles, urging as a rule that the evidence in favor of any such particular occurrence is insufficient to be a proof, and that the universe is subject to scientific law which cannot be broken. The Christian philosophy, on the other hand, reasons that God's law is an expression of God's will which thus exercises a transcendent prerogative over that which is His creation.

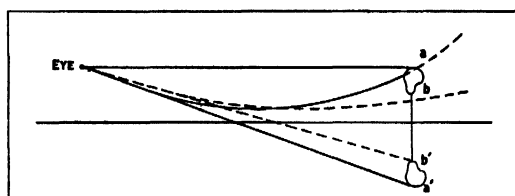
**MIRACLE PLAYS.** *See* MYSTERY OR MIRACLE PLAYS.

**MIRAGE**, a curious phenomenon due to an optical illusion, observed especially in hot, arid countries and occasionally at sea. It is caused by the irregular reflection and refraction of light in layers of air which are of a different temperature and density. In the desert mirage, a familiar occurrence in all hot, dry countries, the intense radiation from the sand heats

up the layer of air in contact with it and causes it to become more rarefied than the cooler strata above, even those as little as a few feet higher.

The difference in refractive index between the two layers may then become so great that rays from a distant object, which arrive in a nearly horizontal but slightly downward direction, cannot penetrate into the lighter air but are reflected upward by the boundary. To the observer standing above this boundary, it will become like a mirror in which he sees distant objects reflected as if by a lake, and he may perceive two images of the same distant object, one obtained in the usual way, and a second, inverted one, by this reflection.

Owing to little irregularities and a small amount of turbulence in the layers of air, the actually ob-



DIVERTING OF RAYS IN MIRAGE

Mirage makes the rays from *a* and *b* appear to come from *a'* and *b'*

served images are usually grotesquely distorted. Some may even appear to be suspended in air, and the whole effect gives rise to weird apparitions, the most essential of which is always a large body of water, sometimes seemingly rippled as by the wind. Tarred roads in a hot, dry climate may produce the same effect, that of pools of water in which the surrounding objects appear reflected.

In the ocean mirage, of much rarer occurrence, the hotter and rarer layer of air is above the observer who now sees distant objects reflected against the lower boundary, and sometimes may perceive these weird, distorted and inverted images, when in normal vision the object is still below the horizon. Upon rare occasions a portion of the atmosphere may possess such a peculiar distribution of temperature and density that it acts as a lens. Objects seen through it appear magnified and suddenly loom up closer than expected, from which the phenomenon is given the name LOOMING.

W. J. L.

**MIRANDA, FRANCISCO DE** (1756-1816), precursor of Latin-American independence, was born of noble parents in Caracas, Venezuela, on June 9, 1756. In 1772 Miranda went to Spain and entered the military life. Later he fought with the American Colonies against England, and after that in the wars of the French during the French Revolution. Miranda conceived the plan of liberating the Spanish-American colonies and of creating a great Inca Empire. He wandered from court to court in Europe seeking aid but, disappointed time after time, he finally prepared an expedition in the United States, which sailed in 1806. This expedition reached Venezuela but failed

and he withdrew to make another attempt the following year. Failing again, he returned to London, where his home became the headquarters of disaffected Creoles and where he founded the *Logia Lautaro*, a lodge which finally claimed as members most of the Latin-American liberators. In 1810 he returned to Venezuela and became the leader of the war for independence, being appointed dictator of Venezuela in Apr. 1812. In July of the same year, however, he capitulated to General Monteverde, and the terms of the capitulation and the disposition he made of certain funds increased a lack of popularity that was growing against him. Simon Bolivar seems to have believed that Miranda betrayed the cause of freedom. Be that as it may, he was imprisoned and died in a dungeon in Cadiz, July 14, 1816. Miranda is called by some authorities half idealist and half adventurer. His long absence from his country made him ignorant of true conditions and gave to his enterprises an artificiality and untimeliness which could only spell failure. At any rate Miranda was influential in stimulating many of the more successful of the Latin-American protagonists of independence.

P. V. S.

**MIRBEAU, OCTAVE HENRI MARIE** (1848-1917), French novelist and art critic, was born at Trevières, Calvados, Feb. 16, 1848. His fame began with novels of Normandy, such as *Lettres de la chaumière*, 1886. Among his later works are *Sebastien Roch*, 1890, a satire on Jesuit schools, *Le jardin des supplices*, 1899, the daring *Mémoires d'une femme de chambre*, 1901, and *Les vingt-et-un jours d'un neurasthénique*, 1902. Among his plays are *Les mauvais bergers*, 1897, *Le foyer*, 1909, and *Les affaires sont les affaires*, 1903, which had a world-wide success. Mirbeau died in Paris, Feb. 16, 1917.

**MIRROR**, an instrument producing images of objects by REFLECTION of light. There are many forms of mirrors, the most common being a plane piece of glass silvered on the back surface. In order to get an image free from distortion and aberration (see ABERRATION IN OPTICAL SYSTEMS), the glass must be absolutely plane. Since the angle of incidence is equal to the angle of reflection for each individual ray, the image formed by a plane mirror is as far behind the mirror as the object is in front of it. In accurate physical work, plane mirrors are usually silvered on the front surface in order to obtain but a single image. In the back-silvered mirror, two images are formed, a weak one by the front surface and a strong one by the back surface.

Mirrors having curved surfaces are much used in scientific work. The reflecting TELESCOPE uses a concave mirror which is paraboloidal in shape. The manufacture of these mirrors requires much care and skill. After the glass has been cast and carefully annealed, it is first brought roughly to the desired curvature either by grinding with a stone of carborundum, by rotating it upon a block of iron of the correct curvature with abrasive material between the two, or by turning the glass with a diamond tool. The final grinding and smoothing is done by placing the mirror

face down on a surface of the calculated curvature and rotating the two with respect to each other, using successively finer and finer abrasives. The mirror is polished by hand with a pad covered with moist rouge, the surface being checked frequently by optical methods. Many sizes of mirrors have been made, the largest of which is 100 in. in diameter, and is part of

a telescope at the Mount Wilson Observatory. At present, the manufacture of a 200-in., fused-quartz mirror is being attempted. This will have four times the light-gathering power of the 100-in. mirror.

Concave mirrors are also extensively used in searchlights. These are usually paraboloidal, and are backed with metal, or made of metal, in order to withstand the intense heat of the source of light which must be placed at the focus. Elliptical mirrors have been used in motion-picture projection.

T. S.

CHINESE MIRROR OF BRONZE  
OF THE HAN DYNASTY

Glass mirrors were first produced in Italy about 1300 although polished metal mirrors had been used for many centuries; for centuries Venice was the source of looking glasses for the entire world. In the 16th century mirrors began to be used on wall spaces as interior decorations. Many beautiful frames were evolved, the most beautiful being produced during the classic revival in France under Louis XVI.

In 1673 a factory was opened at Lambeth, England, by Venetian glass makers imported for the purpose. The first American mirrors appeared at the close of the Revolutionary War. These were the famous Constitution mirrors which bore the gilded American Eagle on the arch at the top. Other interesting forms were the circular bulls-eye mirrors and girandoles. In present day interior decoration small mirrors are used extensively.

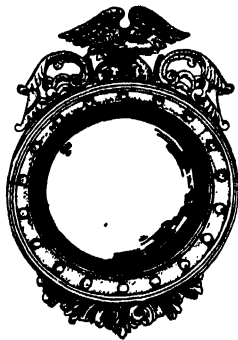


PHOTO M. M. OF ART  
AMERICAN EAGLE MIRROR OF  
ABOUT 1815

**MISDEMEANOR.** At COMMON LAW crimes are classified as felonies or misdemeanors. The distinction is generally governed by statute in the United States, and the usual distinction is that a felony is a crime punishable by death or imprisonment in a penitentiary or state prison for a term exceeding one year, all other crimes being misdemeanors.

**MISENUM**, an ancient city of Campania, in Italy, on the gulf of Puteoli, 3 mi. south of Baiae, and also the name given to the promontory on which it was built. The town had a fine harbor, built by Augustus and made the station of the Roman fleet in the Tyrrhenian Sea. The coast line was dotted with the villas of wealthy Romans, among them the one in which the Emperor Tiberius died. Misenum was destroyed by the Saracens in 890.

**MISERERE**, in music, the setting for the 51st Psalm (Vulgate, 50), or that part of it sung at penitential services in the Catholic and Anglican churches. The name is derived from the first word in the phrase, *Miserere mei, Deus* (Have mercy upon me, O God). The various settings for the miserere are heard on Ash Wednesday, in the Anglican Church, and notably during the Tenebrae in the Church. During Holy Week in the Sistine Chapel three celebrated settings are heard, composed respectively by Allegri, Bai and Baini. The miserere, sung to Allegri's setting, is also regularly used as a funeral choral.

**MISERICORD**, a feature of monastic architecture consisting of a room devoted to meals of which flesh meat was a part. Often the room was a separate building. The word is more commonly used of the folding seat of a choir stall, often decorated on its under side with a richly carved boss that served as a partial support for the priests during long services. These misericord carvings, often with genre subjects, are among the most spontaneous, fresh, and interesting of Gothic wood carvings.

**MISHAWAKA**, a city in St. Joseph Co., northern Indiana, situated on the St. Joseph River, 4 mi. east of South Bend. It is on the Grand Trunk, the New York Central and two industrial railroads, and makes use of the South Bend Airport. The outstanding industrial products are rubber goods, especially rubber and woolen footwear, and machine and foundry equipment; there is also a large rubber-regenerating plant. In 1929 the manufactures were approximately \$27,000,000; the retail trade amounted to \$10,143,431. The present city began with the incorporation of two hamlets on either side of the river in 1838, being named Mishawaka after an Indian princess; the city was chartered in 1899. Pop. 1920, 15,195; 1930, 28,630.

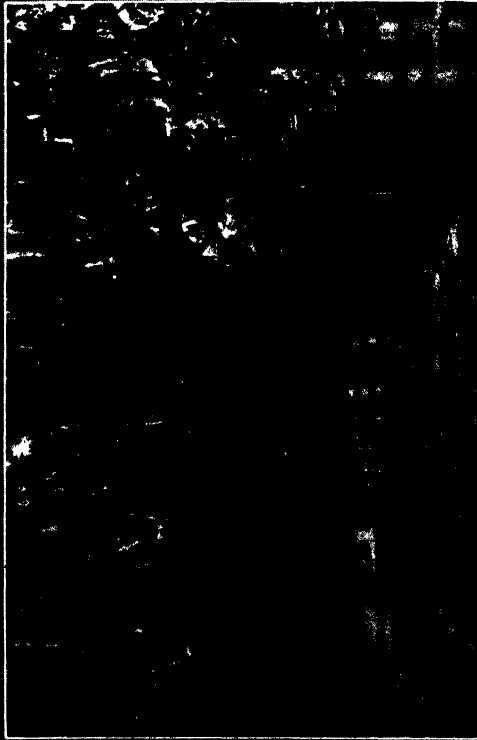
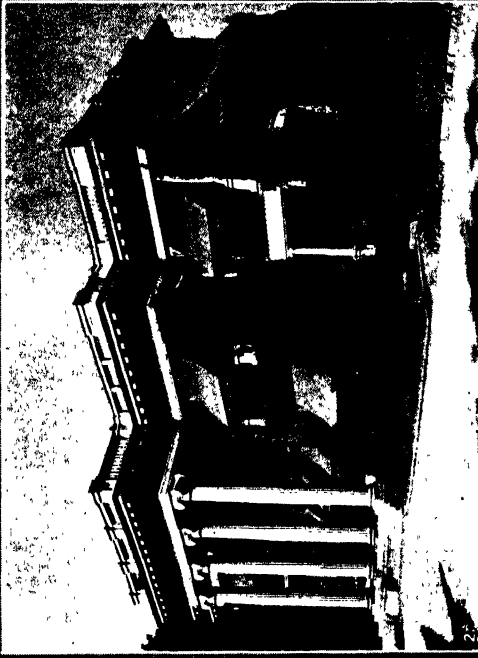
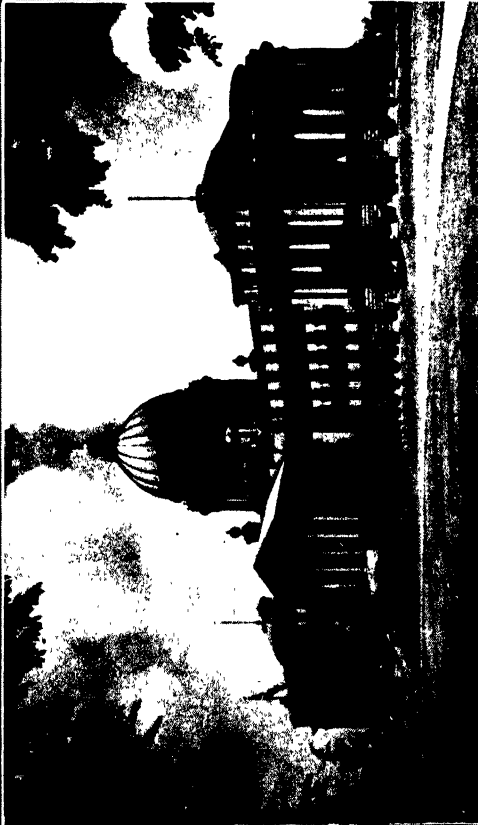
**MISHONGNOVI**, a pueblo belonging to the Hopi group located on the Tusayan mesa in northeastern Arizona. See also Hopi.

**MISKOLC**, capital of the Hungarian county of Borsod-Gömör-Kishont, located at the end of the Szinva Valley at the foot of the Avas Mountain, where there are many caves hewn in the rock. The city has seven churches, including a Gothic structure of the 14th century, a monastery, and a Reformed Church. The products are tobacco, soap and footwear and the important articles of trade are wine, grain, cattle and wool. Pop. 1930, 61,465.

**MISPICKEL**, called also ARSENOPYRITE and arsenical pyrite, because it is the sulpharsenide of iron. It is an ORE of arsenic and often carries enough gold



# MISSISSIPPI



1. 2. COURTESY CHAMBER OF COMMERCE, JACKSON; 3. ASSN. OF COMMERCE, NATCHEZ; 4. RAGUSIN PHOTO, COURTESY CHAMBER OF COMMERCE, BILOXI

## SCENES OF THE OLD AND NEW SOUTH IN MISSISSIPPI

1. Mississippi State Capitol at Jackson. 2. A southern mansion in Jackson.
3. Aaron Burr Oaks on the Natchez Trace, scene of Aaron Burr's surrender, January, 1807. 4. View of the Gulf of Mexico at Biloxi.





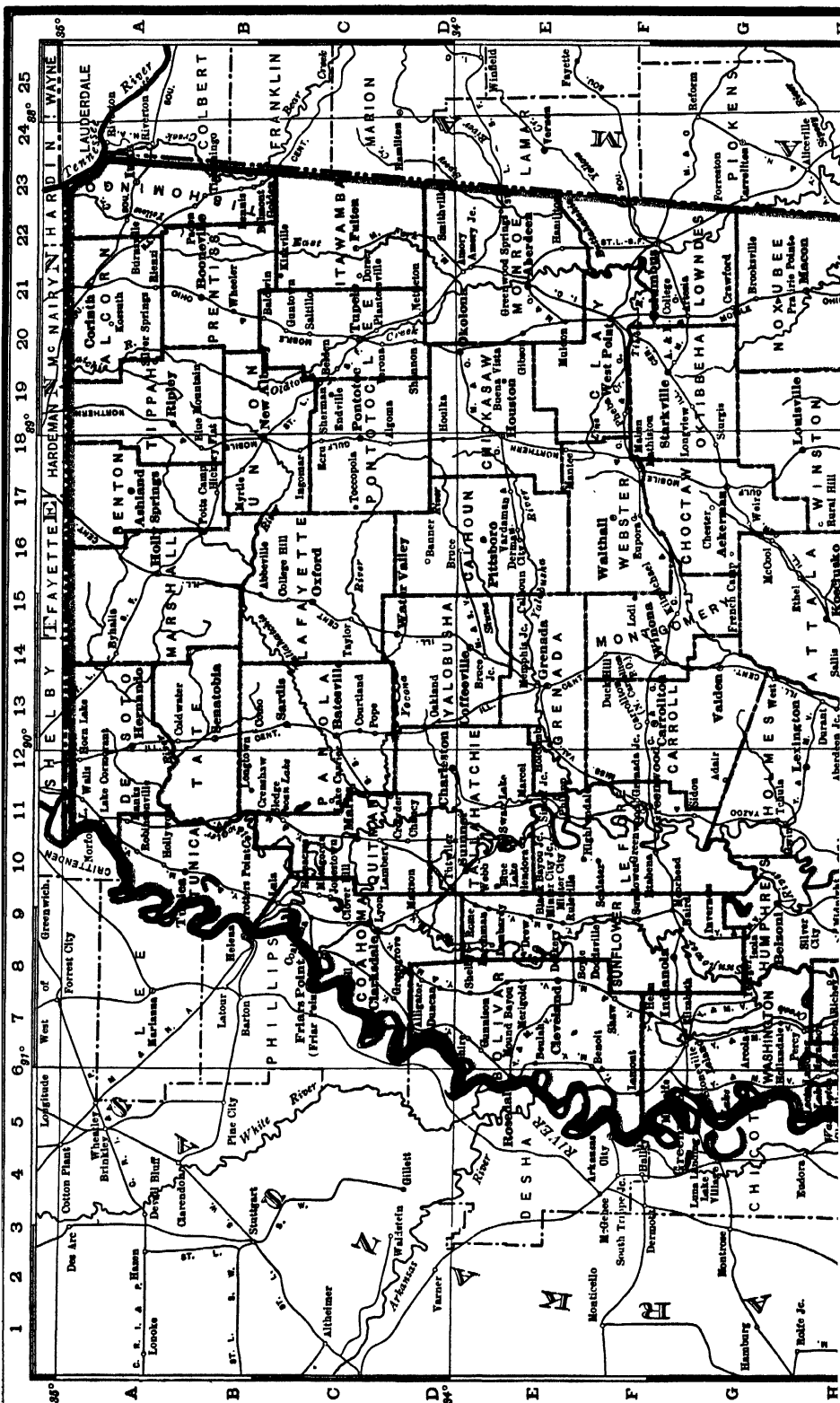
# MISSISSIPPI

Area, 46,865 sq. m.  
Pop. 2,009,821

## PRINCIPAL CITIES

Pop.—Thousands

- |    |                    |      |    |                   |      |
|----|--------------------|------|----|-------------------|------|
| 4  | Aberdeen...        | E 21 | 1  | Drew...           | F 9  |
| 1  | Ackerman...        | G 17 | 2  | Durant...         | H 13 |
| 1  | Amory...           | D 21 | 2  | Ellisville...     | N 17 |
| 1  | Baldwyn...         | B 20 | 1  | Eupora...         | N 17 |
| 1  | Batesville...      | C 12 | 2  | Forest...         | K 15 |
| 4  | Bay St. Louis...   |      | 1  | Forest...         | K 15 |
| 3  | Belmont...         | R 17 | 1  | Forest...         | K 15 |
| 16 | Biloxi...          | R 19 | 15 | Greenwood...      | F 16 |
| 2  | Booneville...      | R 21 | 4  | Grenada...        | E 13 |
| 5  | Brookhaven...      |      | 13 | Gulfport...       | R 18 |
| 1  | Bude...            | N 9  | 19 | Hattiesburg...    | O 17 |
| 1  | Canton...          | N 7  |    |                   |      |
| 1  | Carriere...        | O 14 | 2  | Hazlehurst...     | M 10 |
| 1  | Carthage...        | I 15 | 1  | Hollandale...     | G 7  |
| 1  | Centerville...     | P 6  | 2  | Holly Springs...  | A 16 |
| 2  | Charleston...      | D 12 | 1  | Houston...        | E 18 |
| 10 | Clarksdale...      | E 13 | 1  | Indianola...      | F 10 |
| 3  | Cleveland...       | E 13 | 1  | Itasca...         | F 10 |
| 1  | Cohay...           | I 14 | 1  | Iuka...           | A 23 |
| 5  | Columbia...        | O 13 | 48 | Jackson...        | J 11 |
| 11 | Columbus...        | F 22 | 3  | Kosciusko...      | H 16 |
| 1  | Corinth...         | A 21 | 18 | Laurel...         | M 18 |
| 2  | Crystal Springs... | L 10 | 1  | Leland...         | M 18 |
| 1  | Drew...            | F 9  | 3  | Lexington...      | H 12 |
| 2  | Durant...          | H 13 | 3  | Louisville...     | H 18 |
| 2  | Ellisville...      | N 17 | 2  | Lumberton...      | P 16 |
| 1  | Eupora...          | N 17 | 1  | Lyman...          | R 18 |
| 2  | Forest...          | K 15 | 10 | McComb...         | O 17 |
| 1  | Forest...          | K 15 | 2  | Macon...          | H 21 |
| 15 | Greenwood...       | F 16 | 1  | Mage...           | L 14 |
| 4  | Grenada...         | E 13 | 2  | Magnolia...       | O 9  |
| 13 | Gulfport...        | R 18 | 1  | Marks...          | C 9  |
| 19 | Hattiesburg...     | O 17 | 32 | Meridian...       | K 20 |
|    |                    |      | 2  | Moorhead...       | F 9  |
| 2  | Hazlehurst...      | M 10 | 1  | Morton...         | K 14 |
| 1  | Hollandale...      | G 7  | 2  | Moss Point...     | R 22 |
| 2  | Holly Springs...   | A 16 | 13 | Natchez...        | N 3  |
| 1  | Houston...         | E 18 | 2  | Newton...         | K 18 |
| 1  | Indianola...       | F 10 | 2  | Ocean Springs...  | R 20 |
| 1  | Itasca...          | F 10 | 2  | Okolona...        | D 20 |
| 1  | Iuka...            | A 23 | 2  | Oxford...         | C 16 |
| 48 | Jackson...         | J 11 | 4  | Pascagoula...     | R 22 |
| 3  | Kosciusko...       | H 16 | 3  | Pass Christian... | R 17 |
| 18 | Laurel...          | M 18 | 2  | Pelahtchie...     | K 13 |
| 1  | Leland...          | M 18 | 3  | Philadelphia...   | I 18 |
| 3  | Lexington...       | H 12 | 5  | Picayune...       | R 14 |
| 3  | Louisville...      | H 18 | 2  | Pontotoc...       | C 18 |
| 2  | Lumberton...       | P 16 | 2  | Poplarville...    | O 15 |
| 1  | Lyman...           | R 18 | 2  | Port Gibson...    | L 6  |
| 10 | McComb...          | O 17 | 2  | Quitman...        | L 20 |
| 2  | Macon...           | H 21 | 1  | Richton...        | N 19 |
| 1  | Mage...            | L 14 | 1  | Ripley...         | A 18 |
| 2  | Magnolia...        | O 9  | 2  | Rosedale...       | E 6  |
| 1  | Marks...           | C 9  | 1  | Roseville...      | E 9  |
| 32 | Meridian...        | K 20 | 1  | Sardis...         | E 13 |
| 2  | Moorhead...        | F 9  | 1  | Senatobia...      | B 12 |
| 1  | Morton...          | K 14 | 2  | Shaw...           | S 7  |
| 2  | Moss Point...      | R 22 | 2  | Sharkey...        | D 8  |
| 13 | Natchez...         | N 3  | 4  | Sharkville...     | F 19 |
| 2  | Newton...          | K 18 | 1  | Stonewall...      | K 20 |
| 2  | Ocean Springs...   | R 20 | 1  | Summit...         | O 9  |
| 2  | Okolona...         | D 20 | 1  | Sumrall...        | N 15 |
| 2  | Oxford...          | C 16 | 1  | Tunica...         | A 10 |
| 4  | Pascagoula...      | R 22 | 1  | Tupelo...         | O 20 |
| 3  | Pass Christian...  | R 17 | 1  | Tylertown...      | O 20 |
| 2  | Pelahtchie...      | K 13 | 23 | Union...          | J 18 |
| 3  | Philadelphia...    | I 18 | 4  | Vicksburg...      | K 7  |
| 5  | Picayune...        | R 14 | 4  | Water Valley...   | D 14 |
| 2  | Pontotoc...        | C 18 | 5  | West Point...     | P 20 |
| 2  | Poplarville...     | O 15 | 1  | Winona...         | F 14 |
| 2  | Port Gibson...     | L 6  | 1  | Woodville...      | P 4  |
| 2  | Quitman...         | L 20 | 6  | Yazoo City...     | I 10 |
| 1  | Richton...         | N 19 |    |                   |      |
| 1  | Ripley...          | A 18 |    |                   |      |
| 2  | Rosedale...        | E 6  |    |                   |      |
| 1  | Roseville...       | E 9  |    |                   |      |
| 1  | Sardis...          | E 13 |    |                   |      |
| 1  | Senatobia...       | B 12 |    |                   |      |
| 2  | Shaw...            | S 7  |    |                   |      |
| 2  | Sharkey...         | D 8  |    |                   |      |
| 4  | Sharkville...      | F 19 |    |                   |      |
| 1  | Stonewall...       | K 20 |    |                   |      |
| 1  | Summit...          | O 9  |    |                   |      |
| 1  | Sumrall...         | N 15 |    |                   |      |
| 1  | Tunica...          | A 10 |    |                   |      |
| 1  | Tupelo...          | O 20 |    |                   |      |
| 1  | Tylertown...       | O 20 |    |                   |      |
| 23 | Union...           | J 18 |    |                   |      |
| 4  | Vicksburg...       | K 7  |    |                   |      |
| 4  | Water Valley...    | D 14 |    |                   |      |
| 5  | West Point...      | P 20 |    |                   |      |
| 1  | Winona...          | F 14 |    |                   |      |
| 1  | Woodville...       | P 4  |    |                   |      |
| 6  | Yazoo City...      | I 10 |    |                   |      |





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or cobalt to make it an ore of these metals. *Mispickel* is metallic in appearance, grayish white in color and crystallizes in the ORTHORHOMBIC SYSTEM. It is common in veins carrying quartz and gold, as in the Appalachian region of the United States. See also ORE DEPOSITS.

**MISSAL** (from a Latin word, meaning Mass Book), in the Catholic Church, the book containing the Canon of the Mass, with rubrics and ritual directions, including the Church Calendar. It embraces also the prescribed Mass formularies with the changing prayers and readings from the Scriptures for the different Sundays, feast days and special occasions such as weddings and requiems. Such missals were compiled in ancient times and bear the names of various popes, as Leo I, Gregory the Great and others. At the behest of the Council of Trent, 1545-63, Pius V appointed a commission to revise the missal for the use of all churches under the papacy, except for such as had had their own ritual for more than 200 years. Further emendations were made by Clement VIII, 1604, and Urban VIII, 1634. The present missal was issued by Benedict XV in 1920. For certain religious Orders and dioceses, there are supplements with various Mass formularies.

**MISSION**, a city in Hidalgo Co., southernmost Texas. It is situated in an oil producing region, near the Rio Grande 55 mi. northwest of Brownsville, and is served by two railroads. The surrounding country is very fertile and truck crops, citrus fruit, cotton and broom corn grow in abundance. Oil industries are the chief local interests. Pop. 1920, 3,847; 1930, 5,120.

**MISSIONARY RIDGE, BATTLE OF**, Nov. 24-25, 1863, in the CIVIL WAR, an operation of the BATTLE OF CHATTANOOGA. Gen. Sherman, leading his detachment of the Federal army against the Confederate entrenchments upon Missionary Ridge, an eminence to the east of Chattanooga, discovered that a gorge which had escaped his reconnaissance separated his position from the ridge proper, held by a strong force under Gen. Hardee. The next day Sherman renewed the attack, aided by artillery which had been hauled to his position by hand. But the enemy had been reinforced by the troops under Gen. Bragg, who had fought at Lookout Mountain (see LOOKOUT MOUNTAIN, BATTLE OF) on the 24th, and Sherman's position became critical. Grant ordered the divisions under Generals Sheridan and Wood to charge upon the front of Missionary Ridge, against the first line of rifle-pits. The charge was successful; the troops, without reforming and without further orders, continued the charge to the crest of the ridge. The Confederate force confronting Sherman, seeing its reserve give way, broke ranks and joined the rout.

**MISSION BELLS**, a name given in the Pacific states to a handsome native species of FRITILLARY (*Fritillaria biflora*) with large brownish-purple, bell-like flowers. The name is sometimes applied also to a showy YUCCA (*Yucca Whipplei*), found in the chaparral belt.

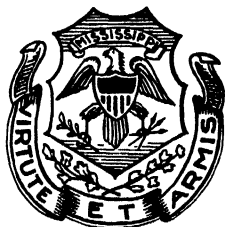
**MISSION INDIANS**, the name applied to certain California Indian tribes which were brought under the influence of the missions established mainly by the Franciscan Order, beginning at San Diego in 1769, in the region from San Diego to San Francisco Bay, Cal. Each mission gathered around it the nearby and sometimes more distant Indian tribes, teaching agriculture and insisting on its practice, as well as attendance at church services, the people being threatened with severe penalties if the regulations were disregarded. The settlements thus established controlled considerable property, ostensibly held in trust for the Indians. In 1834 the Mexican Government disbanded the missions, resulting in the division of the property, the disbanding of the Indians and their removal from the influence of the missions. During this so-called mission period the Indian population of this part of California decreased with extreme rapidity and the native culture as well disappeared.

**MISSIONS**, the organized activities of religious bodies to propagate their faith. Specifically they imply, as understood to-day, the sending forth of men and women with authority to preach and administer the sacraments in regions unevangelized, or among peoples remote from the normal life and activities of the churches. Such missionaries are supported by missionary societies and committees, and their work may include not only the preaching of the gospel, but the practice of medicine, the education of young and old in schools and colleges, the exploration of unknown territories, the development of commercial enterprises and participation in the political life of the people to whom they minister. Such activities have occupied the attention of all the great religions, including Judaism, Christianity, Buddhism and Mohammedanism.

The missionary activities of the Christian Church received their greatest impetus, after the death of Jesus, from the life and teaching of St. Paul, so that by the 3rd century A.D. it has been stated that nearly half of the Roman Empire had become Christian. Among the earliest exemplars of missionaries were St. Gregory of the Armenians, St. Ulphilas of the Goths, St. Martin of the Franks and St. Patrick of the Celts. In the Middle Ages most of the great mission work originated in Rome, Constantinople and in Ireland, and Cyril and Methodius of the Slavs, Lull of the Moslems, Boniface of the Germans and Columba of the Scotch carried on the tradition. Modern missions date from the discovery of the new world and the organization of the Jesuits, while in more recent centuries the leading Protestant churches have covered the earth with their representatives. It is estimated that to-day there are 20,000 ordained Christian missionaries of all churches, 15,000 lay workers, and nearly 25,000 native workers, both men and women. Students of missions think that the future of this work is really in the hands of the native workers, who are being trained to that end.

**MISSISSIPPI**, one of the southern states of the United States, popularly called the "Bacon State." It

is situated between 31° and 35° N. lat. and 88° 7' and 91° 41' W. long. On the north it is bounded by Tennessee, on the east by Alabama, on the south by the Gulf of Mexico and Louisiana and on the west by Louisiana from which it is separated by the Pearl and Mississippi rivers, and also by Arkansas from which it is separated by the Mississippi River. The



MISSISSIPPI STATE SEAL

state comprises an area of 46,865 sq. mi., inclusive of 503 sq. mi. of water surface, with an extreme length of 330 mi. from north to south and an extreme breadth of 188 mi. from east to west. In size Mississippi ranks thirty-first among the states of the Union.

**Surface Features.** Mississippi lies entirely within the Gulf Coastal Plain and

its surface has slight relief although varied by regions having different soil types and natural vegetation. The mean elevation above sea level is 300 ft.

In the extreme northeastern corner are the Tennessee River Hills, rugged and steep, and forested with pine, oak and hickory. Their general height is 650 ft. although some rise to 780 ft., the maximum altitude of the state. Lying immediately west and south of the hills is the Black Prairie belt, low, flat and treeless, comprising an exceedingly fertile farming section. It is in turn surrounded by a crescent-shaped strip of "flatwoods," consisting of a belt of low, poorly drained land similar to a river bottom, supporting a growth of loblolly pine and Spanish oak.

The remainder of the state is a level plain devoted to agricultural crops, except for the Yazoo delta or basin next to the Mississippi River which comprises a part of the flood plain of the river and a low-lying region along the coast known as the Coastal Pine Meadows which are clothed with a growth of long leaf and Cuban pine interspersed with swamps and marshes.

Aside from that part drained by tributaries of the Mississippi, the state slopes southward as indicated by the Pearl and Pascagoula rivers which empty into the Gulf of Mexico. Along the boundary are 85 mi. of shore line. The mainland lies several miles inland of a chain of low sand islands, and the intervening, shelving bottom is covered by the shallow waters of the Mississippi Sound, a famous fishing ground for oysters, shrimps and red snapper.

**Climate.** By reason of its southerly position and its proximity to the Gulf of Mexico, Mississippi has a warm temperate climate. The mean annual temperature for the state is 64.4° F. At Vicksburg the average for January is 48.2° F. and for July 81.3° F. During the period from 1888 to 1930 the highest temperature recorded in Mississippi was 115° F. and the lowest —16° F. The average annual precipitation is 53.1 in., including 1.8 in. of snow. There are seven months in the average growing season of the north-

ern part of the state and ten months in the districts bordering on the Gulf.

**Forests and Parks.** Mississippi is a forest state. Originally 28,800,000 acres of its 29,671,680-acre land area were covered with a splendid pine and hardwood forest. The forest area, according to a 1931 estimate, is 18,700,000 acres and includes exceptional stands of old second-growth and a small amount of virgin timber. Mississippi leads the United States in the production of yellow pine; the other principal trees are red gum, cottonwood, sycamore, oak, hickory, elm and cypress. Practically 40% of the forest land is owned by farmers, the remainder is in comparatively large holdings. An active forestry department has largely devoted its energies to educating forest owners in the best ways of raising, harvesting, and marketing their trees as a crop. Neither state nor national forests have been set aside. A beautiful natural park of 1,324.21 acres at Vicksburg is administered by the War Department. It commemorates the scene of the siege and surrender of Vicksburg in 1863 during the Civil War.

**Minerals and Mining.** The mineral resources so far known and developed are very limited in variety and value. With mineral productions in 1929 amounting to \$2,572,616, Mississippi stood forty-sixth among the states. The principal products were sand and gravel, 2,766,036 tons, valued at \$1,277,746, and clay products, \$1,189,142.

**Soil.** When properly drained, the alluvium of the Delta region is the richest soil in the state. However, great areas of black calcareous loam, extending throughout the prairie districts, are exceptionally fertile, as are the brown loam and loess soils of the western part of the state. In northeastern Mississippi there are gravelly yellow loams poorly adapted for crop raising. Reddish loams characterize the east central part of the state while a rich calcareous strip is found to the south. Southern Mississippi, except the Delta region, possesses extensive areas of wholly sandy soils, mostly unfit for agriculture.

**Agriculture.** Mississippi is an important agricultural state, usually ranking second only to Texas in the production of cotton.

In 1930 17,332,195 ac. or 58.4% of the entire land area was in farms, 312,663 in number, with an average size per farm of 55.4 ac. and an average value per acre of \$32.79. Of the farm area 7,454,835 ac. or 43% was crop land; 5,344,127 ac. or 31%, pasture land; and 3,370,635 ac. or 19%, woodland. The total value of farm property was \$692,813,919, of which \$568,322,065 was represented by land and buildings; \$41,609,042, by implements and machinery; and \$82,882,812, by domestic animals.

According to the census of 1930 Mississippi produced in 1929 field crops to the value of \$270,501,649, ranking eighth among the states. It stood second in cotton and cottonseed, fourth in sweet potatoes, fifth in figs and pecans and sixth in tomatoes. The chief crops was cotton, 1,875,108 bales grown on 4,009,534 ac. and valued at \$161,259,288, together with cottonseed, 914,893 tons, \$29,734,023. Other important crops



were grains, \$35,776,543, chiefly corn 34,935,627 bu.; vegetables, \$25,058,386; hay and forage, 409,285 tons, \$7,612,258; and fruits and nuts, \$2,047,052. Among the vegetables were sweet potatoes \$4,912,958, tomatoes \$3,203,715, potatoes \$1,081,306, and beans \$516,380, cabbages \$433,589, and watermelons \$400,620. The leading fruit and nut crops were peaches 559,869 bu., pears 171,299 bu., apples 139,618 bu., oranges 73,708 boxes, strawberries 1,491,738 qts., figs 946,586 lbs., and pecans 1,428,428 lbs. The state ranked second both in sugar cane grown for syrup, 3,249,122 gals., and in sweet sorghum produced, 1,353,003 gals.

Farm products sold by cooperative marketing rose from \$1,395,040 in 1919 to \$5,621,126 in 1929. Farm machinery and equipment in 1930 included 85,563 automobiles, 16,503 motor trucks, 5,542 tractors, 632 electric motors and 2,186 stationary gas engines.

**Animal Industry.** Mule-raising, in which Mississippi stands second among the states, and cattle-raising are the chief livestock interests. According to the census of 1930, the state ranked twenty-third in total value, \$82,882,812, of domestic animals on farms. Among these were mules, 369,345, valued at \$32,924,734; horses, 102,677, \$6,224,995; cattle, 1,008,672, \$32,855,158; swine, 732,781, \$6,271,100, and sheep, 110,056, \$463,862.

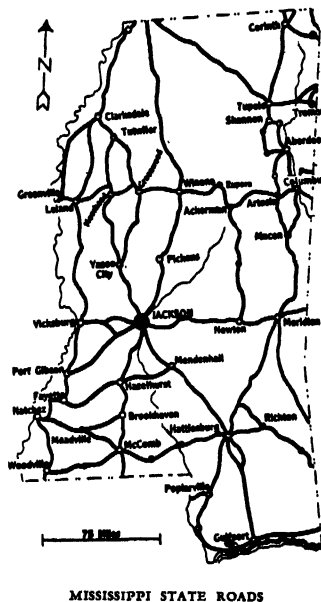
Of the cows on farms, 471,468 were kept mainly for milk production and 103,416 mainly for beef production. In 1929, 130,644,269 gals. of milk were produced; the butter churned on farms amounted to 21,832,203 lbs. The total value of dairy products sold was \$10,316,522. The value of all poultry raised, chiefly chickens, was \$7,826,216; the chickens sold were valued at \$2,077,923. Of 30,435,985 doz. chicken eggs produced, valued at \$8,660,404, 11,914,683 doz., with a value of \$3,351,701, were marketed.

**Fisheries.** The total commercial fish catch in 1930 amounted to 38,418,000 lbs., valued at \$1,213,000. Over \$1,000,000 of this came from the marine catch in the Gulf of Mexico and the rest from the Mississippi River. Biloxi is the center of the fishing industry and the oyster is usually the most valuable single species taken, followed by buffalo fish, sea trout, mullet, catfish and paddlefish. In 1930, the United States Bureau of Fisheries planted the following fingerlings and yearlings in Mississippi waters: 1,168,688 catfish, 693,100 carp, 3,884,712 crappie, 571,344 large mouth black bass and 46,000 of other species. During the flood season, the Bureau's station at Friar Point rescued 5,793,485 fish and returned them to the Mississippi River.

**Transportation.** The MISSISSIPPI RIVER, which forms the entire western boundary of the state, affords water transportation to the Atlantic, Pacific and Gulf coasts through the port of New Orleans, La. The Federal Government, cooperating with private interests, also has improved the harbor of Gulfport, on the Gulf of Mexico, with a channel 300 ft. wide and 23 ft. deep. Although Mississippi's first railway, from Woodville to St. Francisville, La., was completed in 1837, little further progress was made until late in the

nineteenth century. In 1930 the state's total railway mileage was 4,284, with the Yazoo & Mississippi Valley, Illinois Central, Southern, Mobile & Ohio and the New Orleans, Mobile & Chicago the most important lines.

The state highway system had a total mileage of 78,069 on Jan. 1, 1930. This included 16,112 mi. of surfaced roads and 5,110 mi. of improved state highways. Highway expenditures during 1929 were \$23,243,057, of which \$4,682,676 was paid by the state and \$18,560,381 by county and local governments. The state gasoline tax produced an income of \$6,917,575 in 1930 as against \$4,088,200 in 1926. Motor vehicle registrations in 1930 were 237,094 compared with 177,262 in 1925. The rapid growth of trans-



portation by truck is indicated by registrations, which rose from 18,128 in 1925 to 33,651 in 1930, over 80%. During the same period, the number of buses in operation increased from 2,027 to 3,227.

**Manufactures.** The chief manufacturing industries have been developed through the utilization of the state's forest and agricultural resources.

According to the Census of 1930 Mississippi with manufactures for 1929 valued at \$220,917,692 stood thirty-seventh among the states, ranking second in cottonseed oil, cake and meal, third in lumber and timber products and fourth in wood preserving. Its 1,911 establishments gave employment to 4,182 officers and employees, who received \$9,219,836 in salaries, and to 52,086 wage earners, who were paid \$42,207,557 in wages. These factories used a total of 252,580 horse power, expended \$3,839,226 for fuel and power, and \$109,753,071 for materials and supplies, and added by the process of manufacture \$107,325,395 to the value of their output.

The leading industry is the manufacture of forest products. These, valued at \$94,326,731, included lumber and timber, \$84,047,845, and planing mill products, \$10,278,886. Next in value was cottonseed oil, cake and meal, \$36,860,485. The foregoing comprised 60% of the total manufactures of the state. Other important items in order of value were preserved wood, \$12,268,786; cotton goods, \$6,593,947; feeds for animals, \$6,515,557, and steam railway carshop construction and repairs, \$5,874,451.

The chief manufacturing cities with value of output were Jackson, \$19,183,582; Laurel, \$15,921,909; Meridian, \$8,887,922; Vicksburg, \$5,910,637, and Greenville, \$5,687,952.

**Commerce.** According to the census of 1930, there were in 1929 1,713 wholesaling establishments in Mississippi, with total sales of \$385,226,122. These organizations gave full-time employment to 6,746 men and women whose annual salaries aggregated \$10,528,262. The chief wholesaling center is Greenwood.

The total sales of the 17,331 retail stores amounted to \$413,858,201. Sales per store averaged \$23,880; sales per capita were \$205.92.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
General Mdse. ....	4,804	\$160,356,154	38.75
Automotive .....	2,756	87,274,369	21.07
Food .....	5,432	68,313,831	16.52
Lumber & Bldg. ....	378	19,579,958	4.73
Apparel .....	509	16,383,475	3.97
Furn. & Household ..	389	13,886,423	3.35
All other stores .....	3,063	48,064,051	11.61
Total, all stores ...	17,331	\$413,858,201	100.00

**Finance and Banking.** The assessed value of all taxable property in 1929 was \$774,877,211. The total bonded debt in 1930 was \$30,081,500. Total state revenues in 1928 were \$17,448,831. The chief sources of income were property and special taxes, \$6,104,000, and licenses, \$5,092,480. This item included corporation, insurance and motor vehicle taxes and also gasoline taxes of \$2,468,680. Total expenditures were \$21,112,444. The principal payments were for highways, \$6,174,317, educational aid, \$4,819,148, and operation of general departments, permanent improvements and debt service.

There were 253 banks in Mississippi in 1930. Of these, 30 were national banks and 223 trust companies and state banks. Their total capital was \$12,539,150; their surplus and undivided profits, \$11,330,000. Total resources were \$264,431,000, with loans and discounts aggregating \$158,862,000. Demand and time deposits totaled \$194,029,000. Per capita demand and time deposits were \$96.53; per capita savings deposits, \$46.30. The total savings of \$93,053,000 were owned by 126,946 depositors. National bank circulation aggregated \$2,990,000.

**Government.** The legislative power of Mississippi is vested in a senate composed of 49 members and a house of representatives of 139 members, all elected for terms of four years and meeting in biennial sessions

unlimited in duration. The executive department consists of a governor, lieutenant governor, secretary of state, treasurer, auditor, and attorney-general. The governor is elected for a term of four years and is ineligible for re-election. He receives a salary of \$7,500 a year. Judicial power is vested in the supreme court, a chancery court in each county and a circuit court in all counties. The supreme court consists of six judges elected for terms of eight years at salaries of \$6,000 per year.

**Social Welfare Institutions.** There is a training school for abandoned and delinquent children at Columbia, schools for the deaf and blind at Jackson and a school and colony for feeble-minded at Ellisville. Insane hospitals are at Jackson and Meridian. State charity hospitals are at Jackson, Laurel, Vicksburg and Natchez. At Magee is a tuberculosis sanitarium. A soldiers' home is maintained at Beauvoir (Biloxi P.O.). State farms at Parchman, Lambert, Tchula and Oakley are controlled by three trustees elected by the people, the superintendents being appointed by the governor for a term of four years. Lime plants are also run by the state at Okolona, Waynesboro and Blaine. The penitentiary is at Parchman.

**Education.** The first schools in the state were private schools in operation in 1800. A "public female school" was established in 1801, and Jefferson College was chartered the following year, although it was not opened until 1811. The first move for a general free school system was made in 1846. Separate schools are maintained for whites and Negroes. In 1928-29, there were 300,996 white children and 289,582 Negroes in the public schools, with 9,888 white and 5,453 Negro teachers. The 759 white public high schools had 2,116 teachers and 43,205 pupils. There is no compulsory education law in Mississippi. The number of persons from 5 to 20 years of age attending school in 1930 was 511,095, or 68.7% of the population within the ages specified, as compared with 432,625, or 62%, in 1920. The number of persons 10 years and over unable to read and write in 1930 was 199,761, or 13.1%, as compared with 229,734, or 17.2% in 1920. Negro illiterates in 1930 numbered 177,605, or 23.2%, as compared with 205,813, or 29.3%, in 1920. In 1930 native white illiterates numbered 20,070, or 2.7%, as compared to 22,242, or 3.6%, in 1920.

The state institutions for higher education include the University of Mississippi at University, the Agricultural and Mechanical College near Starkville, the State College for Women at Columbus, the Alcorn Agricultural and Mechanical College for Negroes at Alcorn, and teachers' colleges at Hattiesburg and Cleveland. Among the private institutions are the Mississippi Woman's College at Hattiesburg, the Mississippi College at Clinton, and, for Negroes, Rust College at Holly Springs and Jackson College at Jackson.

**Population.** In 1930 Mississippi ranked twenty-third among the states with a population of 2,009,821 or an average of 43.4 per square mile, an increase of

219,203 or 12.2% over 1920. The population rose from 8,850 in 1800 to 791,305 in 1860, 1,551,270 in 1900, and 1,797,114 in 1910, and fell to 1,790,618 in 1920. In 1930 there were 996,856 or 49.6% whites, 1,009,718 or 50.2% Negroes, an increase from 1920 of 16.7% whites and 8% Negroes. There were 1,458 or 0.1% Indians and 1,221 or 0.1% Mexicans. Of the whites, 989,807 were native born and 7,049 were foreign born. The rural population was 1,670,971 or 83.1% of the total, an increase of 120,474 or 7.8% from 1920; the urban population was 338,850 or 16.9% of the total, an increase of 98,729 or 41.1% since 1920. There were in 1930 three cities with a population of 20,000 and upwards: Jackson, the capital, 48,282; Meridian, 31,954; Vicksburg, 22,943.

**Occupations.** In 1930 844,905 persons, or 42% of the population, were gainful workers 10 years old or older; 72.6% of these were males and 27.4% were females; 41.5% were native white; 0.5% foreign-born white, and 57.8% Negro. Of 557,067 persons connected with agriculture, 305,331 were farmers, and 55,161 farm wage workers. Among other leading occupations, with number of workers, were manufacturing, 82,464; domestic and personal service, 66,027, including 16,851 cooks and 16,309 laundresses; trade, 46,319, including 15,679 retail dealers and 14,781 salespersons; transportation and communication, 36,526; professional service, 27,961, including 13,778 school teachers; clerical service, 15,354, and forest industry, 6,049.

### HISTORY

DE SOTO traversed northeastern Mississippi, 1540-1541. JOLIET and MARQUETTE sailed down the Mississippi to the mouth of the Arkansas, 1673. Iberville founded the first European settlement, Ft. Maurepas, now Ocean Springs, on Biloxi Bay, 1699; the colony was transferred to 27 Mile Bluff, on the Mobile River, in 1702, thence to Mobile eight years later. Other French colonists arrived soon after the first contingent; Fort Rosalie, now Natchez, the oldest continuously-occupied settlement in Mississippi, was founded in 1716, and Biloxi shortly afterward. These settlements shared the interesting history of LOUISIANA, but lagged in growth. The Natchez Indians became hostile, and in 1729 killed over 200 whites at Fort Rosalie alone; in the resultant war the tribe was almost eradicated. CAROLINA fur traders occasionally penetrated overland to the Mississippi. Into West Florida under British dominion, 1763-81, poured immigrants from Great Britain and the Atlantic seaboard; the easterly portion of this district was annexed to Mississippi in 1813 (see FLORIDA). Mississippi itself, after becoming English territory (see PARIS, TREATY OF, 1763), received settlers in considerable numbers, and, having been acquired by the United States at the close of the Revolution (see PARIS, TREATY OF, 1783), received territorial organization in 1798. The census of 1800 reported 8,850 persons in Mississippi. Its northern boundary was extended to the present line in 1804 by acquisition

of the western cessions of GEORGIA and SOUTH CAROLINA. ALABAMA was included until 1817.

Mississippians participated in the CREEK WAR, and in the western theatre of the WAR OF 1812 (see NEW ORLEANS, BATTLE OF). The territory formally became a state on Dec. 10, 1817. David Holmes was the first governor. The capital, previously at Washington and Columbia, was permanently located at Jackson in 1822. The first constitution, aristocratic in tone, was replaced by a democratic one in 1832. The state suffered greatly from the Civil War and from its effects. A sales tax going into effect May 1, 1932, sought to relieve the unpaid tax burden of the state treasury. Always a staunch Democratic state, in 1932 Mississippi voted for Roosevelt.

**BIBLIOGRAPHY.**—J. H. F. Claiborne, *Mississippi as a Province, Territory and State*, 1880; Dunbar Rowland, *Mississippi: the Heart of the South*, 4 vols., 1925.

**MISSISSIPPI, UNIVERSITY OF**, at University, Miss., a coeducational state university, chartered in 1844. It maintained a preparatory department until 1892, and now includes schools and colleges of Liberal Arts and Sciences, Law, Engineering, Education, Pharmacy, Medicine, and Commerce and Business Administration, and a department of Rural Economics and Sociology. The institution is supported mainly by the state legislature. The library contains 46,000 volumes. In 1930 there was a student enrollment of 1,254, and a faculty of 68 headed by Chancellor Alfred Hume.

**MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE**, near Starkville, Miss., a coeducational land grant college established in 1878. The college comprises schools of agriculture, engineering, business and science. In 1931 the total value of land, buildings and equipment was \$4,840,263. The library contains approximately 46,000 volumes. In 1931 the student enrollment was 1,537, with a teaching staff of 95 headed by Pres. Hugh Critz.

**MISSISSIPPIAN PERIOD**, the fifth period in the PALEOZOIC ERA of geological history. It was formerly considered the first subdivision of the Carboniferous Period.

**MISSISSIPPI-MISSOURI DRAINAGE SYSTEM**, the longest river system in the world, draining the great valley between the Appalachian and Rocky mountains, and the St. Lawrence basin and Gulf of Mexico. Its basin covers 1,250,000 sq. mi. or 41% of the United States and in size is second only to that of the Amazon.

The Mississippi River, 2,470 mi. long, is the trunk stream into which the Missouri, 2,551 mi. long, enters 17 mi. above St. Louis. Had the Missouri been discovered simultaneously with the Mississippi, it is likely that the same name would have been given to both streams and that the upper Mississippi, which is less than half the length of the Missouri, would have been considered a tributary. From its source to the Gulf, the Missouri measures about 4,200 mi., the longest stream length in the world. It is usually greater in volume than the upper Mississippi

## MISSISSIPPI RIVER

and dominates the stream after they unite, turning the relatively clear and placid Mississippi into a turbid, sinuous river with bank-cutting undercurrents.

The system has numerous large tributaries, the most important of which are the Ohio, 981 mi. long; the Red River, 1,275 mi.; and the Arkansas, 1,460 mi. Each of these has large feeders. Combined they afford over 15,000 mi. of navigable waterways. The area drained is one of the largest and richest agricultural regions in the world. In it originate 85% of the basic products of the United States, including wheat, 80.8%; corn, 86.9%; iron ore, 97%; coal, 95.8%; cotton, 61.6%; livestock, 78.8%; oil, 70.8%; and lumber, 52.9%.

**MISSISSIPPI RIVER**, the main artery in the river system of central United States, extending from northern Minnesota to the Gulf of Mexico. The name is an Algonquin word meaning Father of Waters. Its source is in Lake Itasca at an altitude of 1,670 ft., whence it flows with an almost uniform fall of .6 ft. per mi. throughout its course of 2,470 mi.

Starting as a small stream, it cuts a tortuous channel through the glacier-scoured marsh and lake country of Minnesota, constantly increasing in size until it reaches a width of 500 ft. at Minneapolis. Here it descends over St. Anthony Falls, making a drop of 65 ft. in  $\frac{3}{4}$  of a mi. Below this point the river widens to 4,000 and 5,000 ft. and as far as Cape Girardeau, Mo., meanders between high wooded bluffs which spread 2 to 8 mi. apart. In this section it gathers the waters of the Minnesota, the St. Croix, the Chippewa, at the mouth of which the stream expands to form Lake Pepin, the Wisconsin, the Des Moines, the Illinois and the muddy Missouri.

At Cape Girardeau the bluffs cease. This was once the mouth of the river which emptied into an arm of the sea extending up from the Gulf. By depositing a great volume of silt the river gradually built up an alluvial plain which is now 600 mi. long and 20 to 75 mi. wide and compares in fertility with that of the Nile. Through this plain the stream has cut a tortuous course of about 1,700 mi., and by continued deposits of silt has raised its bed above the adjacent lowlands and defined its channel by natural levees. At Cairo it receives the Ohio River and lower down the Arkansas and Red rivers. The alluvial banks are varied by several high spots of solid ground used as sites for towns including Columbus, Ky., Memphis, Tenn., Vicksburg, Miss., and Baton Rouge, La.

From St. Paul to its mouth the river has an alluvial bed, the constant shifting of which has formed numerous islands and sand bars and, in the lower course, horse-shoe lakes by cutting off curves and bends.

**The Delta.** The river enters the Gulf through a delta consisting of a marshy, fan-shaped area of more than 12,000 sq. mi. It has been built and is constantly increasing in size by the sediment deposited as the current merges into the sea. Every 1,000 cu. ft. of water carries about 42 lbs. of mud and the total for a year is estimated at 406,250,000 tons or

an amount sufficient to cover 270 sq. mi. to the depth of 1 ft. At the head of the delta the river breaks up into branches or passes, each of which has built its own smaller delta at its mouth. The five largest passes are named Southwest, South, Southeast, Northeast and Pass a Loutre. The South Pass is the principal exit.

**Volume and Discharge.** The total annual discharge at the mouth is estimated at 785,190,000 cu. yds. The minimum discharge at low water is about 100,000 second ft. and at flood stage 2,300,000 second ft. The volume fluctuates with the seasons and according to the discharge of the large tributaries. Above the mouth of the Missouri the discharge of the Mississippi is 30,000 second ft. in low water and 260,000 second ft. at high water. The latter stage occurs usually in May as a result of spring rains. The Missouri discharges 13,000 second ft. in low water and 800,000 second ft. when in flood, which is normally in June and caused by melting snows in the mountains. The Ohio discharges 27,500 second ft. at low water and 1,500,000 second ft. at high water, a stage which cannot be accurately anticipated. It has a rise in January due to early rains over its basin and in the following spring months is subject to freshets according to rainfall.

When these flood stages occur at separate times the lower trunk of the river is capable of carrying their volume but when they overlap, or when there is a second flood on the Ohio and two crests meet, a disastrous flood usually occurs. Flood waters are measured at Cairo at the mouth of the Ohio. A height of 50 ft. or more above low water generally results in a major flood which the levees cannot withstand.

**Levees and Flood Control.** The natural levees along the banks of the lower Mississippi have been supplemented by artificial ones to protect the lowlands from floods. The standard levees are 8 ft. wide at the top, 150 ft. at the bottom and vary from 15 to 25 ft. high. They are made of earth thickly sown with Bermuda grass and strengthened in critical places by revetments to prevent bank caving and destruction of levee lines. Such levees are adequate in normal years but have given way under exceptionally high water. The flood of 1927, the highest then on record, registered a rise of 56.4 ft. at Cairo and lasted more than six weeks with 47 recorded levee breaks. It flooded about 28,000 sq. mi. of land, causing a loss estimated at \$355,147,000.

This disaster inspired a new program of flood protection by the United States government. In May 1928 President Coolidge signed the Jones-Reid Bill providing \$325,000,000 for a program of work to be carried out by the Mississippi River Commission and extending from Cape Girardeau to the head of the passes. The plan includes raising and strengthening the existing levees, the building of floodways outside of the main channel, and possibly reservoirs.

A floodway or side basin will be provided between Birds Point and New Madrid, Mo., to give additional safety to Cairo. Below the mouth of the Arkansas

the flood waters in excess of what the main river will safely carry away will seek the Gulf through the lowlands west of the river, the Tensas and Atchafalaya basins and the Red River backwater area. Protecting levees are to be constructed on the edges of these lowlands to keep the excess waters within a definite channel. New Orleans will be given additional protection by a controlled spillway at Bonnet Carre, emptying into Lake Pontchartrain. In 1930 considerable progress was made on the set-back levee of the New Madrid floodway and on the Bonnet Carre construction.

**Navigation and Water Power.** Navigation extends to Minneapolis, 1,944 mi. above the mouth of the river. Here at St. Anthony Falls is a water power improvement consisting of a lock and dam with a maximum installed capacity of 18,000 h.p. There are several immense power dams above Minneapolis and at the headwaters there are six large reservoirs with a storage capacity of 93,662,093,260 cu. ft. which secure a uniform flow of the river to Lake Pepin.

A project approved in 1930 will provide a nine-foot channel from Minneapolis to the mouth of the Ohio to be obtained by open channel work supplemented by locks and dams. There are existing locks and dams at Moline, Ill., at Smith Island in the Rock Island rapids, at Keokuk, Ia., and at Hastings, Minn., which aid navigation and furnish water power.

The 9-ft. channel will be extended to Baton Rouge by dredging and maintaining contraction works. From Baton Rouge to the head of the passes the river naturally scours a channel of 34 ft. or more although dredging is often necessary to remove shoals. The passes require extensive improvements of jetties and dikes to keep them clear.

**Freight Traffic.** Since the World War freight traffic on the river has been revived because of the cheap transportation it affords for bulky products when delivery is not urgent. A tug can guide or tow a train of steel barges carrying an amount which would require 400 to 600 freight cars. In 1929 transportation figures were: from Minneapolis to the mouth of the Ohio, 1,390,262 tons; from Cairo to Memphis, 2,328,334 tons; from Memphis to Vicksburg, 2,835,060 tons; from Vicksburg to New Orleans, 7,727,383 tons; the port of New Orleans, 15,995,374 tons valued at \$908,536,416. The freight consisted chiefly of vegetable food products, lumber and logs, iron and steel and the manufactures therefrom, coal, sand and gravel and the like.

**History.** The first white man to discover the Mississippi was Hernando de Soto, Spanish explorer, who came upon the lower course in 1541. In 1673 MARQUETTE and JOLIET explored the upper course to the mouth of the Arkansas, and in 1682 LASALLE, starting at the mouth of the Illinois, descended the river to the Gulf. He took possession of the entire basin for France, naming it Louisiana for Louis XIV. In 1763 the valley east of the river, except that occupied by New Orleans, was transferred to England by treaty, and became the possession of the United States

in 1783 at the close of the Revolution. The valley to the west was acquired in 1803 by the Louisiana Purchase.

During the next 50 years the importance of the Mississippi as a commercial waterway gave great impetus to the settlement of the Middle West.

**MISSISSIPPI STATE COLLEGE FOR WOMEN**, an institution at Columbus, Miss., organized in 1884, was the first state college founded for women. It was conceived for the "moral and intellectual advancement of the white girls of the state." The institution offers courses in arts and sciences and in home economics. The grounds and buildings are valued at \$2,375,000. The library contains 23,000 volumes. In 1930 there were 1,300 students and a faculty of 89, headed by Pres. R. E. L. Sutherland.

**MISSOULA**, a city in western Montana, the county seat of Missoula Co., situated on the Clark's Fork of the Columbia River, near the mouth of the Bitter Root River, 126 mi. northwest of Butte. Bus lines and two railroads serve the city. There is an airport. Located here are the State University and the Regional Headquarters of the United States Forest Service. The city has lumber mills and beet-sugar factories. In 1929 the manufactures were worth approximately \$3,000,000; the retail trade amounted to \$11,078,932. It is surrounded by summer resorts, dude ranches, and by wheat, fruit and sugar beet farms. Missoula was founded in 1864; incorporated in 1883. Pop. 1920, 12,668; 1930, 14,657.

**MISSOURI**, a North American Indian tribe belonging to the Chiwere division of the Siouan linguistic stock. They are most closely related to the Iowa and Oto. Early in the 18th century they lived on the Missouri River near the mouth of the Grand River. The Sauk and Fox conquered and dispersed them in 1798. This conquest was followed by epidemics and further wars so that by the latter half of the 19th century the few remaining Missouri were included with the Oto when the latter tribe was moved to Indian Territory.

**MISSOURI**, one of the middle western states of the United States, popularly called the "Ozark" and "Iron Mountain" state, situated between 36° 30' and 40° 35' N. lat. and 89° 53' and 94° 43' W. long. It is bounded on the north by Iowa; on the east by Illinois, Kentucky and Tennessee, from which it is separated by the Des Moines and Mississippi rivers; on the south by Arkansas, and on the west by Oklahoma, Kansas and Nebraska, being separated from the two last named states in the northwest by the Missouri River. The state comprises an area of 69,420 sq. mi., inclusive of 693 sq. mi. of water surface. From north to south the extreme breadth of the state is 328 mi. and from east to west the extreme



MISSOURI STATE SEAL

length is 308 mi. In size Missouri ranks eighteenth among the states of the Union.

**Surface Features.** The west-to-east course of the Missouri River divides the state of Missouri into two topographical regions. To the north is a rolling plain leveled by the continental ice sheet, which is a part of the great Central Lowlands. South of the broad Missouri Valley are the Ozark Plateaus which extend into Missouri from Arkansas. The western one-third of this region is known as the Springfield Platform, between 1,000 and 1,500 ft. about sea level, the surface of which is broken by rounded hills and ravine-like valleys. It descends by way of the east-facing Burlington escarpment to the Salem Platform, a lower level which is exceedingly rough and cut by erosion. From its eastern edge rise the St. Francis Mountains, a dome-shaped group of which Taum Sauk peak in Iron County, 1,800 ft. high, is the maximum elevation in the state. The St. Francis River in Dunklin County, 230 ft. above sea level, is the lowest, and the mean elevation of the state is 800 ft.

In the extreme southeast corner is the St. Francis Basin, the upper part of the Mississippi flood plain.

**Climate.** By reason of its interior position, the climate of Missouri is distinctly continental. The mean annual temperature is 54.8° F. At St. Louis the average for January is 30.8° F. and for July, 78.6° F. The Ozark Plateau tempers the summers in the south, but does not appreciably affect the climate of the state as a whole. During the period, 1888-1930, the highest temperature recorded was 116° F. and the lowest -40° F. The average annual precipitation is 39.5 in., ranging from about 35 in. in the north to 50 in. in the south. Crops can be grown for about 180 days in the year.

**Forests and Parks.** The prairie region of northwestern Missouri originally had rich deciduous forests in the valleys of the large streams and numerous groves along the small creeks. Only small and scattered areas of black walnut remain. The great portion of the Missouri portion of the Ozarks had forests of oak, hickory, black gum, red cedar, walnut, cherry, shortleaf pine and some sugar maple. With the exception of remote sections these have been cut over leaving oak brush and small groves of red cedar. The southeastern lowlands, an old flood plain of the Mississippi, was originally well wooded with cottonwood, oak, soft maple, cypress, tupelo and red gum, with some magnolia, tulip trees, persimmon, sassafras and catalpa which overlapped the region of northern hardwoods. Trees grew to tremendous size in some sections due to the rich alluvial soil. Practically all of this timber has been cut. A state Department of Forestry, created in 1925, is actively engaged in protecting young second-growth timber and in fire prevention. A state and forest nursery is maintained at Cedar City and reforestation programs are also under way in other sections. The majority of the 14 state parks are in the Ozarks and contain large springs, picturesque bluffs and gorges. Big Spring Park in Carter County has the largest spring in the state; it

has a daily flow of over 300,000,000 gallons and gushes from beneath picturesque limestone cliffs 500 ft. in height. Mark Twain State Park preserving the birthplace of Mark Twain is situated on beautiful bluffs overlooking the Salt River. The parks have camp grounds and the majority feature fishing, swimming and other recreational activities.

**Minerals and Mining.** The most important mineral resources commercially utilized in Missouri in 1929 were lead ores, high quality clays, bituminous coal and limestone. The lead ore districts, the most productive in the United States, are situated in the southeastern and southwestern counties. Among the widely distributed clays are valuable deposits near St. Louis suitable for making fire brick. Coal beds are found in about 25 counties in the northern, central and western districts. Limestone, quarried in large quantities for building purposes, is also extensively used for making lime and, in conjunction with limitless supplies of shales and clays, for making Portland cement. Formerly Missouri was a leading producer of zinc, obtained from sphalerite mined in the Joplin district, but the richer deposits have been worked out. Among other valuable mineral products are sand and gravel, barite, and iron ore, and small quantities of silver, copper and gem stones.

With mineral productions in 1929 amounting to \$78,948,484, Missouri stood seventeenth among the states, ranking first in lead and barite, third in lime and marble, and seventh in limestone. The principal products in order of value were lead, 198,469 tons, \$25,007,094; clay products, \$14,994,548; cement, 7,984,337 bbls., \$11,557,905; coal, 4,030,311 tons, \$9,778,000; stone, 4,397,800 tons, \$7,085,323, including limestone, \$6,175,012, and marble, \$752,978; sand and gravel, 5,775,729 tons, \$4,291,164; lime, 316,579 tons, \$2,319,886; zinc, 11,017 tons, \$1,454,244; and barite, 118,679 tons, \$880,319.

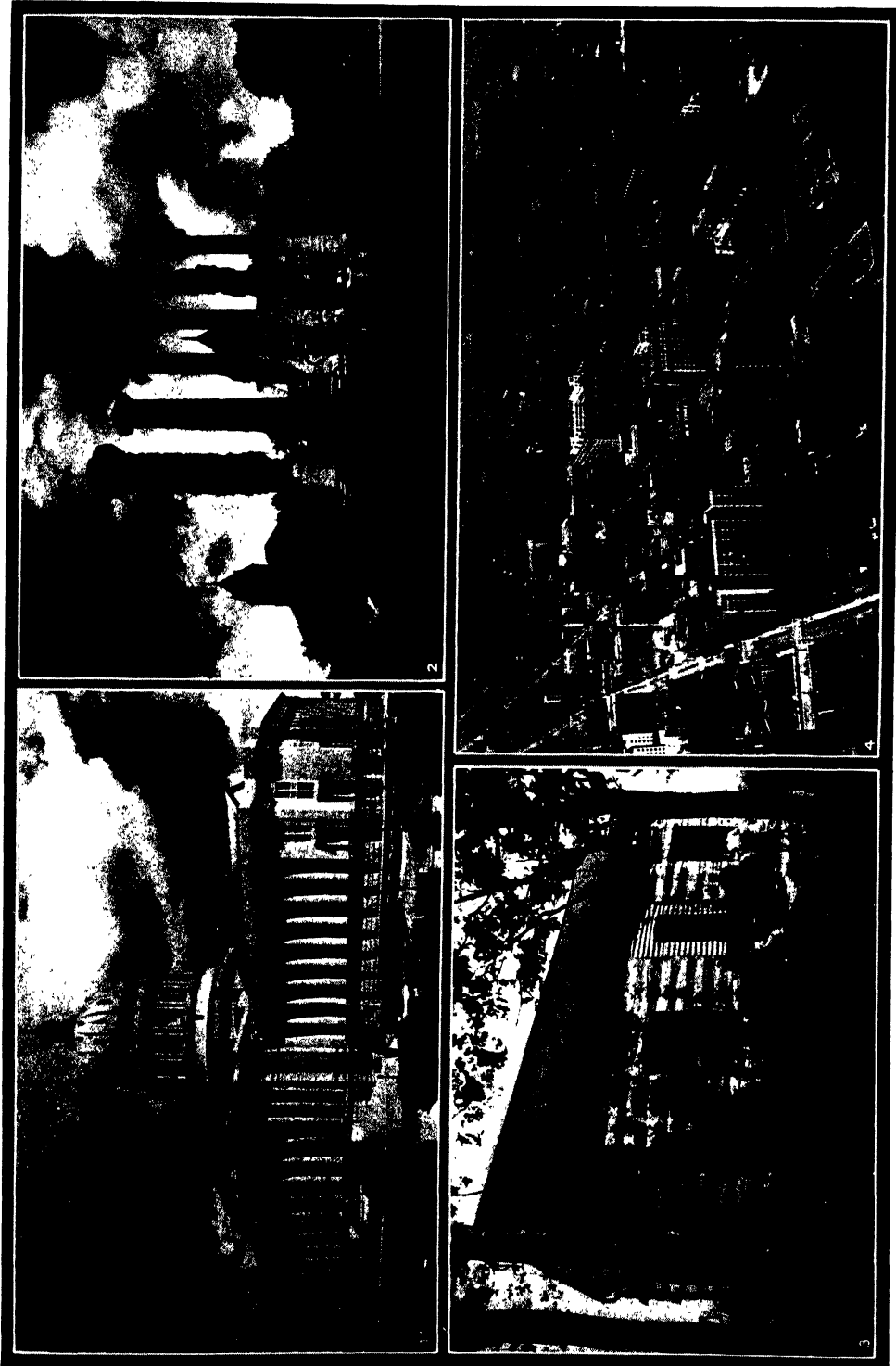
During 1929 439 mines and quarries gave employment to 14,689 persons who received \$18,647,320 in salaries and wages. Of these 5,066 were engaged in coal mining, 4,173 in lead mining, and 2,520 in quarrying limestone.

**Soil.** Silty loams with silty clays beneath are the prevailing soil formations throughout the state. These vary in accordance with the character of the underlying rocks. In the extensive prairie regions dark, heavy, well-drained soils, overlying deep subsoils, are most common. Generally they possess abundant lime and grow darker in color from east to west. In the Ozark region the stony soils are predominantly gray brown or red in color. The gray soils are lacking in lime but the red soils usually possess much larger amounts. The southern part of the state contains areas of rich alluvium notable for their exceptional fertility.

**Agriculture.** The principal crops produced are corn, hay, cotton, wheat, vegetables and fruits.

In 1930 33,743,019 ac. or 76.7% of the entire land area was in farms, 255,940 in number, with an average size per farm of 131.8 ac. and an average value per

# MISSOURI



1. COURTESY CHAMBER OF COMMERCE, JEFFERSON CITY: 2. UNIVERSITY OF MISSOURI: 3. ST. LOUIS NEWS SERVICE PHOTO: 4. COURTESY U. S. ARMY AIR CORPS.

## PAST AND PRESENT IN MISSOURI

1. Missouri State Capitol, Jefferson City. 2. On the campus of the University of Missouri at Columbia. Behind the columns is the School of Chemistry and to the left the School of Business and Public Administration. 3. U. S. Grant's cabin near St. Louis, where the soldier-president lived during his farming days.
4. Air view of St. Louis, great business and industrial center of the southwest.







# MISSOURI

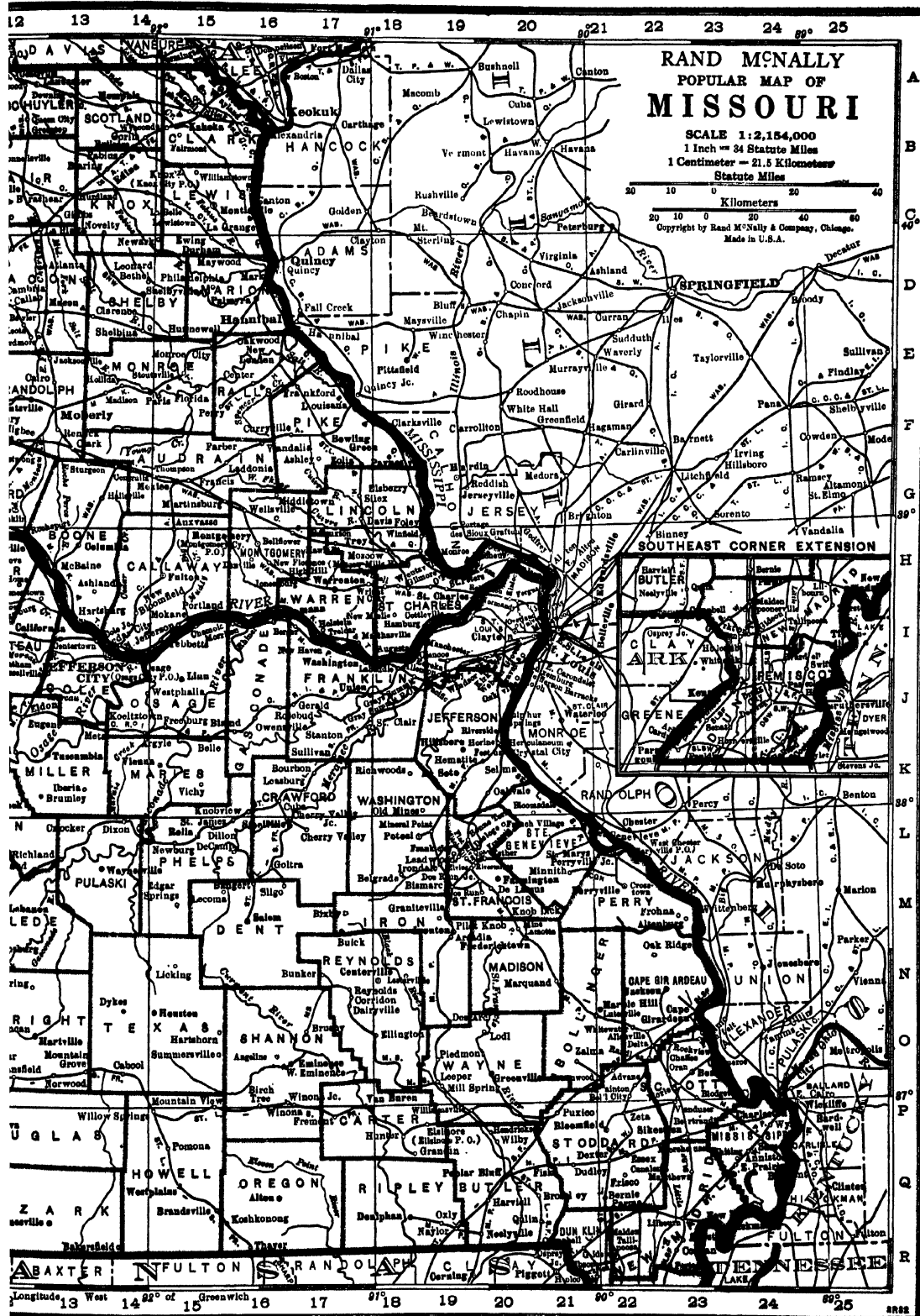
Area, 69,420 sq. m.  
Pop. 3,629,367

## PRINCIPAL CITIES

Pop.—Thousands

- 2 Albany.....B 7
- 4 Aurora.....P 8
- 2 Bethany.....B 8
- 2 Bolivar.....M 9
- 4 Bonne Terre.....10
- 6 Boonville.....H 12
- 2 Brookfield.....D 11
- 2 Brunswick.....F 10
- 3 Butler.....J 6
- 2 California.....I 12
- 4 Cameron.....D 7
- 2 Campbell.....R 21
- 2 Canton.....C 16
- 16 Cape Girardeau.....O 23
- 4 Carrollton.....F 9
- 2 Carverville.....O 9
- 10 Carthage.....O 6
- 5 Caruthersville.....J 25
- 2 Centralia.....G 14
- 3 Chaffee.....P 14
- 3 Charleston.....P 24
- 8 Chillicothe.....D 9
- 10 Clayton.....I 20
- 6 Clinton.....J 8
- 15 Columbia.....H 13
- 3 Crystal City.....K 20
- 5 De Soto.....K 19
- 3 Dexter.....Q 22
- 2 Edina.....C 14
- 3 Eldon.....J 12
- 2 Elvins.....L 19
- 5 Excelsior.....F 7
- 3 Farmington.....M 20
- 3 Fayette.....G 12
- 4 Ferguson.....K 20
- 4 Festus.....O 20
- 2 Forniell.....O 23
- 3 Fredericktown.....M 20
- 6 Fulton.....I 14
- 2 Gallatin.....D 16
- 23 Hannibal.....E 8
- 3 Higginsville.....G 8
- 15 Independence.....G 6
- 3 Jackson.....N 22
- 22 Jefferson City.....14
- 23 Joplin.....O 6
- 400 Kansas City.....G 6
- 4 Kennett.....J 23
- 9 Kirksville.....O 12
- 9 Kirkwood.....I 20
- 2 Lamar.....N 7
- 4 Lebanon.....M 12
- 5 Lexington.....G 8
- 4 Liberty.....F 8
- 4 Louisiana.....I 17
- 4 Macon.....D 13
- 2 Malden.....R 22
- 13 Maplewood.....I 20
- 4 Marceline.....D 11
- 8 Marshall.....O 10
- 5 Maryville.....A 14
- 2 Memphis.....A 14
- 8 Mexico.....G 15
- 14 Moberly.....F 13
- 4 Monett.....P 8
- 2 Monroe City.....E 15
- 2 Mound City.....A 4
- 5 Neosho.....P 6
- 7 Nevada.....L 6
- 3 No. Kansas City.....G 6
- 2 Ocala.....O 8
- 3 Perryville.....M 2
- 2 Plattsburg.....E 6
- 8 Poplar Bluff.....Q 20
- 4 Richmond.....F 8
- 4 Rolla.....L 15
- 11 St. Charles.....H 19
- 3 Ste. Genevieve.....L 21
- 81 St. Joseph.....D 5
- 822 St. Louis.....15
- 21 Sedalia.....I 10
- 6 Sikeston.....P 23
- 4 Slater.....G 11
- 58 Springfield.....O 10
- 7 Trenton.....O 9
- 2 Union.....J 18
- 2 Unionville.....A 11
- 26 University City.....I 20
- 2 Valley Park.....I 20
- 5 Warrensburg.....H 8
- 6 Washington.....18
- 7 Webb City.....O 6
- 17 Webster Groves.....I 20
- 2 Wellsville.....G 16
- 3 W. Plains.....Q 15
- 2 Windsor.....I 9







acre of \$53.23. Of the farm area 15,646,272 ac. or 46% was crop land; 14,296,736 ac. or 42%, pasture land; and 2,438,358 ac. or 7%, woodland. The total value of farm property was \$2,149,429,058, of which \$1,796,246,519 was represented by land and buildings; \$94,521,636, by implements and machinery; and \$258,660,903, by domestic animals.

According to the census of 1930 Missouri produced in 1929 field crops to the value of \$214,329,572, ranking fourteenth among the states. It stood fifth in corn and eighth in hay. In fruit production the state ranked first in strawberries, sixth in grapes, eighth in pears and ninth in plums and prunes. The leading crops were grains valued at \$121,986,479; hay and forage, 3,564,805 tons, \$41,065,797, timothy and clover contributing 2,623,217 tons or 74%; vegetables, \$19,444,166; cotton, 225,351 bales, \$18,816,809; cottonseed, 110,449 tons, \$3,423,919, and fruits and nuts, \$8,425,144.

The chief grain was corn 112,348,071 bu. grown on 4,837,812 ac. Other important grains were oats 19,050,770 bu. and wheat 15,116,509 bu. Among the vegetables were potatoes \$5,889,458, tomatoes \$1,175,325 and sweet potatoes \$1,029,612. The leading fruit and nut crops were apples 1,999,514 bu., peaches 864,182 bu., pears 447,041 bu., plums and prunes 143,529 bu., grapes 17,202,796 lbs., strawberries 27,613,525 qts., blackberries and dewberries 1,352,612 qts. and pecans 350,354 lbs. Minor crops included tobacco, 4,549,089 lbs., and sweet sorghum for sirup, 448,758 gals.

Farm products sold by cooperative marketing rose from \$13,474,992 in 1919 to \$29,448,479 in 1929 and farm supplies purchased by this method, from \$2,964,714 to \$6,506,159. Farm machinery and equipment in 1930 included 176,466 automobiles, 20,132 motor trucks, 24,999 tractors, 4,949 electric motors, and 31,718 stationary gas engines.

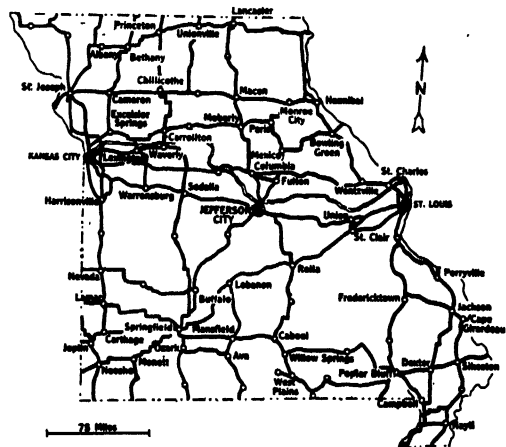
**Animal Industry.** Cattle-raising, hog-raising and poultry growing are the chief animal industries. According to the census of 1930 the rank of Missouri among the states was fourth in swine, seventh in cattle, eighth in mules and ninth in horses; it stood second in chickens raised and chicken eggs produced. The state ranked seventh in total value, \$258,660,903, of domestic animals. Among these were 2,782,400 cattle reported from 223,588 farms or 88% of all farms in the state and valued at \$133,258,100; swine, 3,861,240 in number valued at \$37,868,877; horses, 597,090, \$32,643,611; mules, 295,778, \$22,160,782; sheep, 1,750,089, \$11,484,087; goats, 131,882 \$347,645, and asses and burros, 3,492, \$189,060.

Of the cows on farms, 969,569 were kept mainly for milk production and 432,701 mainly for beef production. In 1929, 369,134,036 gals. of milk were produced; the total value of dairy products marketed was \$40,334,261, including \$23,936,143 for cream sold as butterfat. The value of all poultry raised was \$33,387,991. The number and value of the chief kinds were chickens, 40,783,071, \$31,995,879; turkeys, 245,147, \$731,449; geese, 275,083, \$373,372, and ducks, 380,098, \$287,291. The chickens sold, 18,217,672 in

number, were valued at \$14,835,467. Of 180,349,976 doz. chicken eggs produced, valued at \$47,572,728, 144,946,723 doz., with a value of \$38,217,047, were marketed. The sheep industry yielded 5,985,618 lbs. of wool valued at \$2,050,951. Honey, reaching a total of 2,687,614 lbs. valued at \$481,221, was produced from 140,956 hives.

**Fisheries.** The commercial fisheries of Missouri are small, amounting in 1930 to only 2,047,000 lbs. and valued at \$115,000. All of this came from the Mississippi River, and the species taken were buffalo fish, carp, crappie, catfish and sunfish. During the same year, 308,689 fishing licenses were issued and \$411,876 was received in fees. The state operates eight hatcheries which employed 20 men in 1930. The year's expenditure on fish propagation was \$45,545; the output, 368,386 trout, 262,699 bass and 331,283 other game species. Fish planted in Missouri waters by the United States Bureau of Fisheries during 1930 included: 733,393 rainbow trout, 73,227 large mouth black bass, 16,561 rock bass and 8,000 other game fish.

**Transportation.** The Mississippi River is still extensively used as a waterway from St. Louis to New Orleans. Due to improvements made by the Federal Government, the Missouri River also affords transportation from Kansas City to the river's mouth to boats not over 3 ft. in draught. Lying in the course of several transcontinental lines, the northern portion of the state is adequately served by a network of railway lines. In the southern portion, with its broken topography, railway service is insufficient for the



MISSOURI STATE ROADS

region's requirements. The aggregate railway mileage in 1930 was 7,940, with the Missouri Pacific, Santa Fé, Kansas City Southern, Burlington and St. Louis & San Francisco the principal systems.

Since 1917 the highway system has shown steady improvement. On Jan. 1, 1930, there were 123,666 mi. of highways, including 13,074 mi. of surfaced

roads and 4,827 mi. of improved state highways. Highway expenditures during 1929 were \$41,774,650, of which \$27,320,650 was paid by the state and \$14,454,000 by county and local governments. The state gasoline tax produced an income of \$8,639,161 in 1930, as against \$5,661,145 in 1926. Motor vehicle registrations increased from 604,166 in 1925 to 761,600 in 1930. The growth of trucking transportation is indicated by truck registrations, which rose from 60,740 in 1925 to 91,455 in 1930, or about 50%.

**Manufactures.** Because of rich mineral, timber and agricultural resources, Missouri early in its history established substantial manufactures. In 1849 it ranked tenth among the states in value of factory output and in 1909 held the same relative position. Of the states west of the Mississippi it is surpassed only by California.

According to the Census of 1930 Missouri with manufactures for 1929 valued at \$1,917,155,275 stood eleventh among the states. Its 5,765 establishments gave employment to 37,723 officers and employees, who received \$91,909,198 in salaries, and to 202,879 wage earners, who were paid \$240,368,692 in wages. These factories used a total of 717,978 horse power, expended \$28,743,159 for fuel and power, and \$1,110,914,923 for material and supplies, and added by the process of manufacture \$777,497,193 to the value of their output.

In this output there were 144 separately enumerated groups of manufactures. The state ranked third in boots and shoes, prepared feeds and patent medicines; fourth in flour and electric railway cars; fifth in coffee roasting and stoves, and sixth in butter. Among the products in which Missouri stood seventh were meat packing, women's clothing, confectionery, motor vehicle bodies and parts, paints and varnishes and paper boxes. It ranked eighth in bread and bakery products, men's clothing, printing and publishing, and manufactured ice; tenth in electrical machinery and steam railway carshop construction, and twelfth in iron and steel rolling mill products and furniture.

The leading manufactures, which included 60% of the total output of the state, in order of value, are shown in the following tabulation:

Industry or Product	No. Persons Employed	Value of Products \$
Motor vehicles .....	6,775	246,762,302
Meat packing .....	6,856	180,939,544
Boots and shoes .....	27,251	133,918,578
Flour .....	2,923	89,472,946
Bread and bakery products .....	8,356	59,233,709
Foundry and machine shop products .....	10,677	53,028,519
Electrical machinery .....	8,829	52,936,797
Printing and publishing, newspapers and periodicals .....	8,031	49,334,986
Motor vehicle bodies and parts .....	4,432	42,284,503
Butter .....	1,398	39,323,118
Boot and shoe cut stock .....	3,031	38,392,480
Prepared feeds .....	1,083	36,546,673
Patent medicines .....	2,143	36,300,635
Printing and publishing, book and job .....	7,060	34,271,995
Steam railway carshop construction .....	11,508	33,478,409
Women's clothing .....	7,480	30,660,409

The principal manufacturing centers, with value of output, were St. Louis, inclusive of all St. Louis Co., \$1,068,155,687; Kansas City inclusive of Jackson Co., \$382,007,482; and St. Joseph, inclusive of Buchanan Co., \$136,605,699. These three centers produced about 83% of the manufactures of the state.

**Commerce.** According to the census of 1930, there were in 1929 6,674 wholesaling establishments in Missouri, with total sales of \$3,361,561,643. This volume represented 4.84% of the wholesale trade of the United States and was exceeded only in New York, Illinois, Pennsylvania and California. These wholesalers gave full-time employment to 79,488 men and women whose annual salaries and wages aggregated \$145,671,050. St. Louis and Kansas City, the chief wholesale distributing centers, reported sales of \$1,430,981,458 and \$1,408,793,238 respectively. St. Joseph and Joplin were also important.

The total sales of the 47,216 retail stores amounted to \$1,490,146,846. Sales per store averaged \$31,560; sales per capita were \$410.58.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
General Mdsc. ....	5,798	\$296,893,166	19.93
Food .....	12,642	285,950,910	19.19
Automotive .....	8,376	273,196,984	18.32
Apparel .....	2,948	174,623,773	11.72
Lumber & Bldg. ....	2,778	90,248,839	6.07
Furn. & Household .....	1,296	64,887,842	4.35
All other stores .....	13,378	304,345,392	20.42
Total, all stores .....	47,216	\$1,490,146,846	

The city of St. Louis handled water-borne traffic on the Mississippi River amounting to 583,450 tons, with a value of \$64,429,306.

**Finance and Banking.** The assessed value of all taxable property in 1930 was \$4,972,212,907. The total bonded debt in 1930 was \$87,829,000, with sinking funds of \$1,423,849. Total state revenues for 1928 were \$45,013,708; total expenses, \$41,785,930. The chief sources of income were property taxes, \$15,750,000, and licenses, \$18,540,000. This item included corporation and insurance taxes, as well as taxes on motor vehicles and gasoline, \$6,634,237. The principal payments were for operation of general departments, \$24,247,504, highways, \$15,075,761, educational aid, \$6,262,776, debt service, \$3,218,105, and permanent improvements.

The Bank of St. Louis, Missouri's first bank, was opened in 1816 and liquidated in 1819. It was followed by the Bank of Missouri, which opened in 1817 and failed in 1822. The state had no chartered banks from then until 1829 when the United States Bank opened a branch in St. Louis. This, however, was discontinued in 1833. In 1837 the Bank of the State of Missouri, with five branches, was chartered with both currency and discount privileges. It had a practical monopoly until 1857, when seven more banks of issue were chartered. Due to laxity in enforcement of the banking law, many unauthorized institutions issued currency during this period, only to fail in the

panic of 1873. After this, slowly but surely national banking came into its own. Trust companies became increasingly popular after 1890. There were 1,113 banks in Missouri in 1930. Of these, 119 were national banks, 993 trust companies and state banks and one private bank. The aggregate capital of these institutions was \$111,077,000; their surplus and undivided profits, \$84,930,000. Their total resources in 1930 were \$1,528,332,000, with loans and discounts, including rediscounts, aggregating \$849,383,000. Demand deposits totaled \$759,144,000; time deposits, including postal savings, \$399,898,000. Per capita time and demand deposits were \$319.74; per capita savings deposits, \$105.31. Total savings were \$381,742,000; national bank circulation aggregated \$8,723,000. Bank clearings were \$6,709,368,000 in Kansas City and \$6,559,652,000 in St. Louis, the state's most active banking centers.

**Government.** The law-making power of Missouri is vested in a legislature consisting of a senate composed of 34 members and a house of representatives of 150 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited to 70 days. The executive department comprises a governor, lieutenant governor, secretary of state, treasurer, auditor, attorney-general and superintendent of public schools, all elected for terms of four years. The governor receives a salary of \$5,000 per year. Judicial power is vested in a supreme court, in courts of appeal and in circuit courts. The supreme court consists of seven judges elected for terms of 10 years at salaries of \$7,500 per year.

**Social Welfare Institutions.** The Board of Charities and Corrections controls these institutions. There is a school for the blind at St. Louis and for the deaf at Fulton. An industrial home for white girls is maintained at Chillicothe and for Negro girls at Tip-ton. At Boonville is a reformatory for boys. A home for dependent and neglected children is at Carrollton. A Federal Soldiers Home is located at St. James and a Confederate Soldiers Home at Higginsville. Hospitals for insane are at Fulton, St. Joseph, Nevada and Farmington. At Mt. Vernon is a tuberculosis sanitarium and at Marshall a colony for feeble-minded and epileptics. The state has three prison farms. The penitentiary is at Jefferson City.

**Education.** The first school was opened at St. Louis in 1774 by J. B. Trabeau, who taught there for 40 years. The first real school law was enacted in 1824, and public schools were opened in St. Louis in 1838. A high school was established there in 1853. In 1928-29, in the 7,820 public elementary schools there were 8,450 rural teachers, 10,363 elementary teachers and 543,611 enrolled pupils. The 1,006 high schools had 125,124 pupils and 6,123 teachers. Children from 7 to 14 years of age are required by law to attend school three-fourths of the school year.

The number of persons from 5 to 20 years of age attending school in 1930 was 730,854, or 69.4% of the population within the ages specified, as compared to

688,499, or 66.4%, in 1920. The number of persons 10 years and over unable to read and write in 1930 was 67,905, or 2.3%, as compared to 83,403, or 3% in 1920.

The chief institution of higher learning is the state University of Missouri at Columbia. Other state educational institutions are the teachers' colleges at Kirksville, Warrensburg, Cape Girardeau, Springfield and Marysville; and Lincoln University for Negroes at Jefferson City. Important private colleges and universities include Washington University at St. Louis, St. Louis University, William Jewell College at Liberty and Drury College at Springfield. The Missouri Library Commission has its headquarters in the State Capitol Building at Jefferson City.

**Population.** In 1930 Missouri ranked tenth among the states with a population of 3,629,367 or an average of 52.8 per square mile, an increase of 225,312 or 6.6% over 1920. The population rose from 140,455 in 1830 to 1,721,295 in 1870, 3,106,665 in 1900, 3,293,335 in 1910 and to 3,404,055 in 1920. In 1930 there were 3,398,887 or 93.6% whites and 223,840 or 6.2% Negroes. Of the whites, 3,249,497 were native born and 149,390 were foreign born, a decrease in the latter of 36,636 since 1920. Of the total foreign stock, including foreign born, foreign and mixed parentage, 262,925 or 42.2% were German; 57,178 or 9.2%, Irish; 39,315 or 6.3%, Italian; 38,852 or 6.2%, English; 34,797 or 5.6%, Russian. The urban population was 1,859,119 or 51.2% of the total, an increase of 272,216 or 17.2% from 1920; the rural population was 1,770,248 or 48.8% of the total, a decrease of 46,904 or 2.6% since 1920. In 1930 there were four cities of 50,000 and upwards: St. Louis, 821,960; Kansas City, 399,746; St. Joseph, 80,935; Springfield, 57,527.

**Occupations.** In 1930 1,457,888 persons, or 40.2% of the population, were gainful workers 10 years old or older; 79.5% of these were males and 20.5% were females; 86.5% were native white; 5.5% foreign-born white, and 7.9% Negro. Of the females 15 years old or older 51.9% were single, 27.9% were married, and 20.2% were widowed or divorced.

Among the principal occupations, with number of workers, were farmers, 246,659, and farm wage workers, 82,518; factory operatives and laborers, 102,174 men and 42,399 women, including 24,819 persons in shoe factories, 22,654 persons in iron and steel industries, and 16,891 persons in clothing industries; clerks, 51,202 men and 25,168 women; salespersons, 50,623 men and 17,483 women; servants, 10,264 men and 43,626 women; retail dealers, 51,587; building laborers, 39,573; school teachers, 5,971 men and 23,457 women; chauffeurs, 28,905; stenographers, 1,339 men and 26,738 women; carpenters, 25,895; bookkeepers and cashiers, 8,090 men and 12,340 women; railroad laborers, 14,654, and machinists, 12,466.

## HISTORY

MARQUETTE and JOLIET, probably the first Europeans on the upper Mississippi, followed the river the entire length of Missouri. French *coueurs de*

*bois* obtained some acquaintance with the region, and early in the 18th century French exploring parties traversed the state in search of mineral deposits. St. Genevieve, gateway to the lead district, was founded about 1735. August Chouteau in 1764 erected a trading post at St. Louis; this point became the headquarters of the Missouri River fur trade. After the English took possession of the French-Canadian villages across the Mississippi (*see* ILLINOIS), many of the inhabitants migrated to the Spanish bank of the Mississippi (*see* PARIS, TREATY OF, 1763). The Spanish took formal possession of upper LOUISIANA at St. Louis on Nov. 3, 1770, and retained control until the United States assumed sovereignty at the same place, Mar. 10, 1804. The Spanish authorities fostered the extension of the fur trade to the upper Missouri, and, apprehending an English attack from Canada, encouraged American immigration. At the time of transfer, the region numbered about 6,000 American settlers, perhaps 4,000 French residents, and about 1,500 slaves. Excluding the present state of Louisiana, the LOUISIANA PURCHASE domain was first attached to the Territory of INDIANA, then organized as the Territory of Louisiana, Mar. 3, 1805, with JAMES WILKINSON as first governor and St. Louis the capital. The territorial name was changed to Missouri in 1812. A state government was organized in accordance with an Enabling Act of Mar. 6, 1820, but because of the recognition of slavery in its constitution and a provision forbidding any free negro to reside in the state, admission was delayed (*see* MISSOURI COMPROMISE) until Aug. 10, 1821. The state in 1820 contained 70,647 inhabitants, of whom 11,254 were slaves. Jefferson City was platted as the capital site in 1822. Population mounted steadily, passing the 1,000,000 mark shortly before 1860. Although most of the early settlers were from southern states, many of them were from back-country districts where slavery was unpopular; the influx of German and Irish immigration after 1848 further diminished the popular strength of the Democratic pro-slavery leaders. Missouri remained in the Union, after a bitter contest (*see* CIVIL WAR). The state furnished 108,733 troops to the Union armies, and over 50,000 to the Confederate. Slavery was abolished by a constitutional convention in 1865. Republican in three presidential elections, Missouri broke the precedent in 1932 and by a huge majority gave its 15 electoral votes to Roosevelt. Col. Bennett C. Clark, Democrat, was elected to the Senate and Guy B. Park, Democrat, to the governorship.

**BIBLIOGRAPHY.**—H. C. Conrad, ed., *Encyclopaedia of the History of Missouri*, 1901; Louis Houck, *A History of Missouri*, 1908.

**MISSOURI, UNIVERSITY OF**, at Columbia, Mo., a coeducational institution, established in 1839, was the first state university west of the Mississippi River. It comprises colleges and schools of Arts and Science, Fine Arts, Agriculture, Education, Law, Medicine, Engineering, the Rollo School of Mines and

Metallurgy, Journalism, Business and Public Administration, the Graduate School and the Extension Division. In connection with its experimental work in agriculture, the university maintains a plant for the manufacture of hog-cholera serum. Its productive funds in 1931 amounted to \$3,028,668. The library contained 404,785 volumes. In 1931-32 there were 9,719 students, including the summer enrollment, and a faculty of 335 headed by Pres. WALTER WILLIAMS.

**MISSOURI COMPROMISE**, an act of Congress, Mar. 6, 1820, providing for the admission of Missouri as a slave state, but expressly forbidding slavery in the remainder of the Louisiana purchase lying north of latitude 36° 30', the southern boundary of Missouri. To the House bill, enabling Missouri to become a state, Representative Talmadge added an amendment, Feb. 13, 1819, forbidding the further introduction of slavery into the state, and providing for the ultimate freedom of slaves born within the state. The Senate rejected the amendment. Debate was vehement and prolonged; the great issues involved were the influence of slavery expansion on the political balance of free and slave states, and the right of a new state to control its domestic institutions. The final arrangement was proposed by Sen. Thomas of Illinois, and sponsored by HENRY CLAY, Speaker of the House.

**MISSOURI RIVER**, the principal western tributary of the Mississippi, formed by the junction of the Jefferson, Madison and Gallatin rivers at Three Forks, Mont., in the Rocky Mountains. Of its headstreams the Jefferson is the largest and longest, rising 398 mi. above Three Forks in the Continental Divide at an elevation of 8,000 ft. It is really the upper section of the Missouri.

The Missouri proper is 2,551 mi. long and from Three Forks flows first northward through mountain canyons to Great Falls, Mont., where it enters the plains over a succession of cataracts which lower the stream bed 612 ft. in 10 mi. Thence it flows eastward into North Dakota, changes its course to south-east and follows this general direction through South Dakota, between Nebraska and Iowa, and across Missouri to join the Mississippi 17 mi. above St. Louis. On its way it gathers the waters of the Marias, Milk, Yellowstone, Platte, Kansas and several smaller streams. The area drained is estimated at 580,000 sq. mi., 2,550 of which are in Canada.

Known as the Big Muddy, the Missouri is characterized by the heavy wash of its turbulent current against its banks, thereby causing extensive erosion and caving and gathering an immense volume of reddish silt. The load is too great for even its rapid current and deep, shifting deposits settle on the stream bed, creating an unstable channel. Bends in the river are formed by erosion and then are frequently cut off by the same process and create islands, sandbars and crescent-shaped lakes in the former river channel.

The amount of silt carried to the mouth of the river is estimated at 14.7 cu. ft. to every 1,000 cu. ft. of water. The minimum discharge is 13,000 second



ft. and the maximum, 800,000; the fluctuation between low and high water is 30 ft. The Missouri begins to rise in March as a result of spring rains on the plains and reaches a moderately high water stage in April, but the flood point is reached in June when the stream carries melting snows from the mountains.

In high water the river is navigable to Fort Benton, 2,285 mi. from the mouth and about 3,560 mi. from the Gulf. Open channel work is in process to secure a 6-ft. channel in low water from the mouth to Sioux City, Iowa, and includes snagging, rock removal and bank protection to Fort Benton.

The freight carried on the Missouri in 1929 aggregated between Kansas City and the mouth, 1,158,332 tons valued at \$5,255,638; between Sioux City and Kansas City, 208,800 tons, \$379,411; between Fort Benton and Sioux City, 5,268 tons, \$180,359. The products so shipped were chiefly wood and paper, wheat, coal, sand and gravel and building materials. With channel improvements the river is again assuming importance as a medium of commercial transport. Before the extension of railways to the west it saw a period of considerable activity and, especially for fur traders, was a valuable water passage to the Northwest. Fleets of steamboats were operated on it between 1819 and 1858.

The first white men to see the river were Marquette and Joliet who passed its mouth in 1673 but the first to explore it to its source were Lewis and Clark in 1804-5.

**MIST**, the finest type of rain that falls. It consists of such small drops that one cannot perceive their falling motion, and forms a comparatively transparent cloud, which distinguishes it from Fog. One can feel a mist but cannot see it, while one cannot feel a fog but observes it because of its opaqueness.

**MISTASSINI, LAKE**, the largest lake in the province of Quebec, Canada, located in the interior at an elevation of about 1,200 ft. A line of rocky islands divides it into two narrow bodies, the greater being 100 mi. long and from 13 to 17 mi. wide. The water has a depth of from 300 to 400 ft. and abounds in fish. It drains through Rupert River into James Bay.

**MIST-FLOWER** (*Eupatorium caelestinum*), a perennial herb of the composite family called also blue boneset. The plant is found in rich soil from New Jersey to Michigan, southward to Florida and Texas. It grows from 1 to 3 ft. high with oblong, opposite, toothed leaves and numerous small heads of violet or blue flowers borne in terminal clusters. The mist-flower is cultivated as a late-flowering ornamental.

**MISTI**, a volcanic mountain of Peru, 5 mi. north-east of Arequipa. It rises to a height of 20,320 ft. and has a perfectly shaped cone, very like that of Fujiyama in Japan. Harvard University erected an astronomical observatory near the perpetually snow-clad summit of Misti, but the station is now discontinued. The last volcanic eruption was in 1839.

**MISTLETOE**, the name given to various small shrubs of the mistletoe family (*Loranthaceae*) para-

sitic on trees. They are somewhat bushy evergreens with jointed branches; brittle twigs; thickish, opposite leaves; minute, greenish flowers, and white, glutinous, berry-like fruit.

The New World mistletoes (*Phoradendron* sp.) comprise about 100 species, chiefly tropical, of which some 10 occur in the United States, mostly in the South and West. Among the best known are the American mistletoe (*P. flavescens*), which grows in globular masses on deciduous trees, especially the red maple, elm and tupelo, from New Jersey to Missouri and southward to Florida and New Mexico, and the hairy mistletoe (*P. villosum*), found mainly on oaks in the Pacific states. In some localities, as in southern New Mexico and Arizona, mistletoes kill the trees which serve as their hosts.

The common Old World mistletoe (*Viscum album*), long associated with Christmas festivities, is widespread in Europe and temperate Asia, growing most frequently on the apple and poplar. Various birds, which feed upon the berries, disseminate the plant by wiping their beaks, to which the sticky seeds have adhered, upon the branches of trees. Later, when the seeds thus deposited germinate, their roots penetrate to the sap-bearing layers of the bark. When found growing upon the oak, an event of very rare occurrence, the mistletoe was venerated with elaborate rites by the ancient Druids. According to Scandinavian legend, the arrow with which the blind god Höder slew the sun-god Balder was made of mistletoe wood.

A. B. J.

**MISTRAL, FRÉDÉRIC** (1830-1914), Provençal poet, was born at Maillane, department of Bouches-du-Rhône, Sept. 8, 1830. He had chosen a legal career, but in 1859 he published *Mirèio* and thenceforth devoted himself to literature. The poem is his masterpiece and is a real epic of rustic life. Mistral wrote various other works in Provençal, including *Lou Tresor don Felibrige*, 1886, and in 1904 was awarded, jointly with José Echegaray, the Spanish dramatist, the Nobel Prize for Literature. He died at Maillane, Mar. 25, 1914.

**MISTRAL, GABRIELA** (1865- ), pen name of Lucila Godoy, who is the wife of the noted Mexican historian and publicist, Carlos Pereyra. La Mistral, a native of Chile, has gradually assumed the leadership of the women poets of Spanish America. Her reputation, firmly consolidated by her tour of the Continent, derives from her collection entitled *Desolación*, one of the most interesting of contemporary Spanish poetic documents. Gabriela Mistral's verse is an office of love, ministration, pardon, self-abnegation. She is not, whether in verse or prose, of startling originality; it is her intensity that makes her simple, sacrificial nobility a thing of beauty. Her *Sonnets to Death* are her chief title to fame, and in these her cheated womanhood has achieved a lesser masterpiece of the Spanish elegy. She has done much teaching in the rural districts of Chile, with an apostolic sense of her mission. Her dominant trait is not desolation so much as hope in a minor key.

**MISTRAL**, a violent cold north wind that blows through the Rhone Valley toward the Mediterranean where, in winter, the air is warmer and less dense than in the north.

**MITCHEL, JOHN** (1815-1875), Irish Nationalist agitator, was born in County Derry, Nov. 3, 1815. He practiced law and wrote on political topics until 1848 when he founded the *United Irishman* to promote Irish nationalism. That year he was arrested and sent to a British convict prison in Tasmania. He escaped in 1853 and spent the next 19 years in the United States working for the Confederate cause and slavery. After returning to Ireland in 1872 he was elected to parliament from Tipperary but was declared ineligible. He died at Cork, Mar. 20, 1875.

**MITCHELL, DONALD GRANT** (1822-1908), American writer, was born in Norwich, Conn., Apr. 12, 1822. He was graduated from Yale College in 1841. He studied law, but abandoned it to write. He served as consul at Liverpool and traveled in Europe during 1844-46, and thereafter lived on his farm. His best known work is *Reveries of a Bachelor*, published under the pen name of Ik Marvel in 1850. This was followed by *Dream Life*, 1851, *My Farm at Edgewood*, 1863, and *Dr. Johns*, a novel, 1866. Mitchell died in Connecticut, Dec. 15, 1908.

**MITCHELL, JOHN** (1870-1919), American labor leader, was born at Braidwood, Ill., Feb. 4, 1870. As a boy he worked in the coal mines at Braidwood before traveling through the West where for several years he worked in the mines of various states. He returned to Illinois and worked in the mines at Spring Valley until 1890. Of a thoughtful temperament, he was interested in the improvement of the condition of the miners. He was president of the local assembly of the Knights of Labor, 1889, and in 1890 he joined the United Mine Workers of America. He occupied a number of local offices in that organization and in 1896 was made chairman of the legislative committee with the responsibility of assuring salutary state labor legislation.

In 1897 Mitchell was a member of the Illinois state executive board of the United Mine Workers of America, and the same year was appointed a national organizer of the organization. He was elected national vice-president in 1898, and after a few months as acting president, was selected president in Jan. 1899. He was annually reelected until 1908, when he refused the office on the plea of poor health. During Mitchell's presidency the membership of the United Mine Workers increased from 43,000 to 300,000 and to his leadership were attributed improvements in the wages, hours of work, and in the working conditions of the miners.

Mitchell believed in the use of the strike as a weapon with which to extort concessions from the mine operators after other methods had failed. The most prominent of the strikes which he promoted was that of the Pennsylvania anthracite miners in 1902. The refusal of the operators to yield to the miners'

demands shifted what had been a labor controversy to the category of a national issue, since the nation was confronted with a possible coal famine in the winter of 1902-3. President Roosevelt appointed the Anthracite Coal Strike Commission to arbitrate the dispute between the operators and miners, and the commission granted the miners a substantial portion of their demands.

From 1898-1914 Mitchell was vice-president of the American Federation of Labor. The National Civic Federation, which was formed in 1900 on the principle that the welfare of labor was the joint concern of employers and employees, appointed him a member of a committee which was to strive for industrial peace by means of conciliation and arbitration between disputants. Mitchell's primary concern was for the social and economic betterment of the miner, but he always considered that there was a close association between the welfare of the miners and that of the operators. Mitchell's activities included the writing of several books on the labor problem. In 1914 he was appointed a member of the Workmen's Compensation Commission of New York State, which was created that year by a law he had helped to frame. The commission was absorbed by the State Industrial Commission in 1915 and Mitchell was appointed chairman of the Industrial Commission of the State of New York. He died in New York City, Sept. 9, 1919.

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**MITCHELL, SILAS WEIR** (1829-1914), leading American neurologist of his time, was a graduate of the Jefferson Medical College, Philadelphia (1850), following which, for two years, 1851-1852, he worked with Claude Bernard in Paris. Mitchell was particularly renowned for his use of the rest cure of "Weir Mitchell treatment." He divided his attention between literary and professional pursuits. His monographs and articles, numbering over one hundred, covered subjects from the venom of poisonous snakes to neurasthenia. *Wear and Tear, or Hints for the Overworked*, published in 1871, was considered a best seller of its time; *Fat and Blood*, published in 1877, was translated into French, German, Spanish, Italian and Russian. Weir Mitchell died in Philadelphia, January 4, 1914. M. F.

**MITCHELL**, a city in southeastern South Dakota, the county seat of Davison Co., situated on the bluffs of the James River, 77 mi. west of Sioux Falls. The city is served by two railroads. Mitchell is surrounded by a rich farming region, producing corn, alfalfa and live stock. The local industries include railroad shop work and food-packing and tile manufactures. The retail trade in 1929 reached a total of \$11,130,438. In the last week in September every year a harvest festival is held in the city's Corn Palace. Mitchell was settled about 1880 and became a city in 1883. It is the seat of Dakota Wesleyan University. Pop. 1920, 8,478; 1930, 10,942.

**MITCHELL, MOUNT**, a lofty peak in Yancey Co., North Carolina, occurring in the Black Moun-

tains, a division of the Appalachian system. Its summit reaching to 6,711 ft. is the highest in the United States east of the Rocky Mountains. Since it was not, like other North Carolina mountains, subject to glaciation, it possesses a considerable depth of soil to the top and has a rounded summit clothed with a dense growth of spruce and balsam fir, due to which it is sometimes known as Black Dome. The lower elevations have forests of pine and varieties of hardwoods. On its slopes are deep, narrow ravines and entanglements of often impenetrable rhododendrons and laurel thickets 10 to 20 ft. high. A logging railway takes passengers nearly to its summit, where there is an enchanting view of the dusky blue-wooded summits of adjacent mountains. In the summer months Mt. Mitchell is richly colored with rose-purple rhododendron blossoms, scarlet and orange azaleas and great masses of white and pink laurel.

**MITER**, a fillet or head-covering used by ancient Oriental and Asiatic peoples to indicate the dignity of rulers. In the times described by Homer it was a thin sheet of metal to protect the abdomen, worn under the breastplate. Among the later Greeks it was a sort of hair ribbon which gradually developed into a kerchief. In the Catholic Church the miter is the characteristic headgear of the bishop. Originally it was a round cap or headcloth, the corners of which hung down over the neck and back. After the 11th century the round cap gradually grew higher and formed two triangles united together, one in front and one behind. It is made of white or red silk, embroidered and sometimes set with jewels, with two ribbons (*infulac*) hanging over the shoulders. Abbots also wear miters, not so ornate as those of the bishops and, as a rule, without the streamers.

**MITERWORT** (*Mitella diphylla*), a delicate spring wild flower of the saxifrage family called also bishop's cap. The plant grows in rich woods from Quebec to Minnesota and southward to North Carolina and Missouri. It is a slender hairy perennial with round heart-shaped root leaves and a flowering stem bearing two small opposite leaves and a narrow cluster of white flowers.

**MITES**, the popular name for tiny arachnids of numerous families comprising several thousand species that belong to the same order (*Acari*) as the ticks. Mites are found all over the world, and live on land, in the sea, and in fresh water. About half are parasites on animals and plants. Their bodies are usually oval, with four pairs of legs, and red, brown or black in color. Some species are of microscopic size, while others reach a length of half an inch. The sexes are distinct, and the young are generally hatched as six-legged larvæ.

Many mites are extremely troublesome pests. Among them are the itch mites (*Sarcoptes*) which cause scabies in men and animals, the gall mites (*Eriophyidae*) which damage trees and bushes, the chicken mite

(*Dermanyssus gallinae*), which sucks the blood of fowls at night, and the red "spiders" (*Tetranychidae*), which infest gardens and greenhouses.

**MITFORD, MARY RUSSELL** (1787-1855), English writer, was born at Alresford, Hampshire, Dec. 16, 1787. She cared for an extravagant father and, after they were reduced to poverty, she wrote for a living, and produced in 1824-32 the series of sketches, *Our Village*. Among other works are *Poems*, several plays, including *Rienzi*, and *Belford Regis*, a novel. Miss Mitford died at Swallowfield, Jan. 10, 1855.

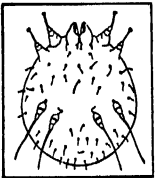
**MITHRA** or **MITHRAS**, the Persian god of light, or sun god, was the source of life and redeemer of souls. He fought **AHRIMAN**, the god of evil. In his cult there were initiation rites and the worshiper had to pass through seven degrees to attain great holiness. There were underground chambers where the most advanced attended his mysteries. The worship of Mithra was carried from Cilicia to Rome by pirates, and became popular among the Roman soldiers who, in turn, introduced it into European countries and Britain. It was a rival religion with Christianity in the West. In the East women were not allowed to share in the rites.

**MITHRADATIC WARS**, a series of three conflicts between the armies of Mithradates VI the Great, most celebrated of the line of kings of Pontus by the same name, and the Romans. The first Mithradatic war occurred during 88-84 B.C., and was caused by the invasion of Mithradates's kingdom in Asia Minor by Nicomedes, King of neighboring Bithynia. Although supported by the Romans Nicomedes was repelled, and Mithradates ordered the execution of all Roman citizens within his kingdom. Accordingly 80,000 persons were massacred. But the King of Pontus was subsequently defeated by the Roman Flavius Fimbria, and forced to relinquish all his holdings in Asia. The second Mithradatic war occurred during 83-82 B.C., and ended in the defeat of the attempted invasion of Pontus by the Romans. The third Mithradatic war, waged during 74-65 B.C., was caused by Mithradates's campaign to prevent the Romans from occupying Bithynia. Mithradates was forced to give ground, and as he retreated was attacked by his son, who had turned against him. In 63 B.C. the father committed suicide.

**MITHRAISM**, the worship of Mithras, the Persian god of light, whose cult flourished in the Roman Empire during the first three centuries of the Christian Era and became the chief rival of Christianity. The name of Mithra is invoked both in the Hindu Vedas and in the Persian Avesta. In Zoroastrian mythology Mithras is secondary only to the supreme Ormuzd. The worship of Mithras developed with



FOLLICLE MITE  
(*Demodex folliculorum*). Greatly enlarged



ITCH MITE  
(*Sarcoptes scabiei*).  
Greatly enlarged

the growth of the Persian Empire and by the time of the conquests of Alexander the Great had reached its full-grown stage. Mithraism reached Rome early in the 1st century with elements borrowed from the star worship of the Chaldeans and from the Greeks of Asia Minor, and spread rapidly. It made most of its converts among the commercial classes, soldiers and slaves, and the earlier Roman emperors were disposed to look with favor on this new faith because of its teaching the doctrine of the divine right of sovereign rulers. The barbarian invasions of the 3rd and 4th centuries resulted in the wholesale destruction of the temples of Mithras, and as Christianity grew more powerful, the cult of Mithras weakened and gradually died out.

**MITHRAS.** See MITHRA.

**MITILENE**, or **MYTILENE**, chief town of the island of Lesbos in the Aegean north of Chios. The city was first situated on an island adjoining the eastern shore. Later, connected by a paved stone bridge, it rapidly spread on that island and in a way imposed its name on it, Lesbos being also known as Mitilene. The chief exports are olive oil, soap, skins and sardines. Stock raising and mining are the principal industries, especially of coal. The area of Lesbos is 675 sq. mi., the surface being broken by mountains covered with trees and valleys of great fertility. Besides Mitilene there are four other cities, Methynna, Antissa, Eresus and Pyrrha. Pop. 1928, 27,870.

**MITRE, BARTOLOME** (1821-1906), Argentine soldier, statesman, poet and historian, was born June 26, 1821 in Buenos Aires. He began his military career when he was little over 20 years. He was an opponent of Rosas and spent much time in exile and engaged in journalism. In 1852 he returned to Buenos Aires and assisted General Urquiza in the war against Rosas. He commanded the forces of Buenos Aires at the defeat of C  peda, which forced that province to reenter the Argentine Confederation, 1859. In the following year he was elected governor of Buenos Aires and in 1861 led a revolution which overthrew the national administration. From 1862 to 1868 he was president of the Argentine Republic. He fostered railroad building and brought about the adoption of a commercial code (1862), the revision of the tariff laws, and the establishment of telegraph lines, postal services and public schools. In 1865, when the Paraguayan War broke out, he became commander-in-chief of the forces of Argentina, Brazil and Uruguay. Mitre was one of Argentina's best writers. He founded *La Naci  n*, one of the world's outstanding newspapers. His two finest works, perhaps, are his biographies of Belgrano and San Mart  n, *Historia de Belgrano*, (1858), and *Historia de San Mart  n*, (1887-1890). He died in Buenos Aires in 1906.

**MITTANIAN**, an extinct language spoken by the Mittanians in northern Mesopotamia and preserved, except for some proper names, only in a tablet written in CUNEIFORM sent by the Mittanian King Tushratta to the Pharaoh of Egypt in 1400 B.C. In its structure and vocabulary Mittanian seems to exhibit an

affinity with ELAMITIC and KHARRIAN, as well as with such modern South Caucasian languages as GEORGIAN.

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**MIWOK**, a North American Indian tribe and linguistic stock, also known as Moquelumnan. Besides the Miwok two other groups were known, the Olamentke and the Lake County Moquelumnan. The Miwok inhabited a district in California between the Cosumnes and Fresno River, and another region on the California Coast from the Golden Gate to Salmon Creek, north of Bodega Bay and eastward to Sonoma and the southern part of Lake Co. Both in population and extent of occupied territory they are said to have been the largest Californian Indian group. Few of them now survive. The Miwok lived in pole and brush houses, earth-covered in winter. Acorns with the small game of the area constituted the principal food. Marriage was by purchase, but return gifts were paid by the bride's parents over a period of years. See also MARRIAGE. SHAMANISM was practiced by both men and women. The acorn dance and an annual mourning ceremony were important features of the Miwok ceremonial life. Cremation of the dead was practiced.

**MIXED COURTS**, an international court with foreign and native judges which has superseded the practice of EXTRATERRITORIALITY in some parts of the world. In Egypt, for example, the mixed tribunals were regulated in their powers by a code of law. Appointment of judges rested with the Egyptian administration, but in the selection of foreign judges, it acted upon the recommendation of the foreign governments. The Mixed Court of the International Settlement at Shanghai was such in a different sense. It was organized to cover cases, civil and criminal, affecting Chinese living within the International Settlement, as the extraterritoriality treaties did not cover these cases.

**MIYANOSHITA**, a celebrated spa of Japan, situated on the island of Honshu. The village is in the mountainous district, known as Hakone, lying to the southeast of Mt. Fuji, at the neck of the Izu Peninsula between Sagami and Suruga bays. This section is that of an extinct volcano. Lake Ashi occupies part of the outer crater, and sulphurous hot springs gush from other sides of the mountains. The town, reached by electric cars crossing deep gorges, is a center for excursions to the beautiful spots in the vicinity. Miyanoshita is 1,377 ft. above sea level. Scenery and fine air are its attractions. Pop. 1928, 3,000.

**MIZAR** (*Zeta Ursae Majoris*), the middle star of the handle of the Big Dipper and of the second magnitude. It was the first DOUBLE STAR to be discovered, the first to be photographed, and the first SPECTROSCOPIC BINARY to be recognized. The brighter component consists of two nearly identical white stars, 3.7 times as heavy, and 25 times as brilliant as the sun, which revolve around each other in 21 days, at a distance of about 28 million miles. The fainter com-

ponent, 10 times brighter than the sun, is at least 30 billion miles distant from the brighter pair. In addition there is the fifth magnitude star *ALCOR* 50 times still farther away but undoubtedly connected. The whole system of *Mizar* and *Alcor* is 70 light years distant, and forms part of the *URSA MAJOR* cluster. See *STAR: map*.

**MNEMONICS**, devices for aiding the memory. A mnemonic is simply a scheme to assist in the factor of recall. If there is some way of connecting a thing with another, more easily remembered, the latter may serve as a mnemonic device for the recall of the former. For example, the telephone number 2468 may be recalled by remembering that the four numbers are separated by two in each case. During the Middle Ages the schoolmen invented a rather clever mnemonic to help them in remembering the valid moods of the syllogism in its four figures. This is the famous *Barbara Celarent Darii Ferioque Prioris*, familiar to students of elementary logic. "Thirty days has September, April, June and November" is a well-known mnemonic scheme for remembering the number of days in the months of the year.

Mnemonics are often much more cumbersome than useful, and are of little avail where quick action is necessary. Sometimes such aids to memory are more difficult to remember than the things one desires to remember. An individual may make his own device and then forget its purpose, though he may recall the mnemonic perfectly.

**MNEMOSYNE**, in Greek mythology, the goddess of memory, daughter of *URANUS* and *GAEA*, and mother by *Zeus* of the nine *MUSES*.

**MOA**, one of a family (*Dinornithidae*) of large, flightless birds allied to the kiwis and ostriches, which formerly existed in great number in New Zealand. Judging from the freshness and abundance of various remains, as bones, feathers and eggshells, found in the upper deposits of both islands, the moas must have still been living within the last four or five hundred years. It is thought that their extermination was brought about by the natives, who prized their flesh and eggs for food. Some 20 species of moas existed, several of remarkable size; one species (*Dinornis maximus*) stood 10 or 12 ft. high. These birds were practically wingless, with long necks, rather small heads and very stout legs. They subsisted largely on vegetable matter and scraped together a pile of grass and leaves for a nest. The eggs of some species measured nearly 8 in. in length.

**MOAB**, one of the sons of *Lor*, and the name of an ancient people in Palestine who inhabited the mountainous region lying east of the Dead Sea and the lower part of the River Jordan, Genesis 19:36-37. The Moabites maintained their independence for many centuries and the indications are that their country had become rich and populous, agriculturally and commercially, by 900 B.C. They worshiped the Goddess *Astarte* and their language differed only dialectically from that of the Hebrews. The Moabites in the course of centuries gradually lost their religious

and political identity, while Israel, their neighbor, retained its leadership.

**MOABITE**, a SEMITIC language spoken by the Moabites, known from the *Mesha Stone*, 900 B.C. It is a CANAANITE dialect little different from HEBREW. The plural termination is *-n* (the so-called nunation), and a reflexive is formed as in ACCADIAN and ARABIC by inserting *t* after the first radical.

**MOBERLY**, the largest city of Randolph Co., in north central Missouri, situated 135 mi. northwest of St. Louis. Two railroads serve to transport the lumber, farm crops, livestock and dairy products of the region. The city has railroad and machine shops, hosiery mills and shoe and cheese factories. In 1929 the manufactures reached about \$6,000,000; the retail trade amounted to \$7,021,679. Coal fields are found in the vicinity. Moberly was laid out in 1866 and incorporated as a city in 1873. Pop. 1920, 12,808; 1930, 13,772.

**MOBILE**, a city and port in southern Alabama, the county seat of Mobile Co. It is situated on the west side of Mobile Bay, at the mouth of the Mobile River, 30 mi. north of the Gulf of Mexico. It is served by five railroads, including the Southern and Louisville and Nashville. Mobile is one of the most important ports in the country, having fifty steamship lines to all parts of the world; principal exports are cotton, lumber, coal, iron, and agricultural products. It is one of the leading cotton markets and shipping points in the country, and has drydocks, shipbuilding yards, cotton compress warehouses, machine shops, foundries, and cotton, lumber and pulp and paper mills. In 1929 the total of all manufactured products was about \$19,000,000; the retail trade amounted to \$33,056,707.

Mobile, settled by the French in 1711, capital of Louisiana Colony until 1722, was later held successively by England and Spain before it passed into American hands. It was captured by the Americans from the British in 1813; and in 1865 was captured by Farragut, who had previously destroyed the greater part of the Confederate fleet in Mobile Bay. Springhill College, a Jesuit institution, is located near Mobile at Spring Hill, Ala. Pop. 1920, 60,777; 1930, 68,202.

**MOBILE BAY**, an inlet from the Gulf of Mexico, situated in southwestern Alabama. It receives the Mobile River from the north. The length of the bay is about 36 mi. and its width varies from 8 to 18 mi. The main entrance to it is between Dauphin Island on the west and Mobile Point on the east. There is a channel 32 ft. deep in low water from this entrance to the harbor located along the lower 5 mi. of the Mobile River. On Mobile Point is Ft. Morgan, an important Confederate fortress during the Civil War.

**MOBILE BAY, BATTLE OF**, Aug. 5, 1864, an engagement in the CIVIL WAR, which resulted in an important victory of the Federal fleet of 18 vessels under Admiral Farragut. Mobile, with its harbor between two estuaries guarded by Fts. Morgan and

Gaines, was a favorite port for blockade-runners and an invaluable seaport to the Confederacy. Farragut, ordered to the Gulf of Mexico in Jan. 1864, postponed his attack against Mobile until, in July, the arrival of 5,000 troops under Gen. Granger provided a complementary land force. Farragut's fleet included four ironclads. After Granger was landed on Dauphin Island, in the rear of Ft. Gaines, Farragut entered upon his plan of attack to run past the two forts, chance the sunken obstructions, and engage the Confederate flotilla, including the *Tennessee*, admittedly the strongest ironclad afloat, within the harbor. On the morning of Aug. 5 the four monitors led the assault, the wooden sloops, each lashed to a gunboat, following. The monitors took position between Ft. Morgan and the wooden ships, performing the double duty of drawing the fire of the fort and of meeting the *Tennessee*. While the Federal gunboats disposed of the Confederate ships, the monitors forced the surrender of the *Tennessee*. Farragut, dramatically lashed to the mast of his flagship, directed the engagement rashly but successfully. On Aug. 7 Ft. Gaines surrendered; on the 23rd Gen. Page, after a stubborn defense, yielded Ft. Morgan. The harbor of Mobile was thereby closed; the city was left in Confederate hands until April, 1865.

**MOBILIZATION**, the assembly and preparation of the man-power of a nation for war. This includes the procuring, classifying, equipping and assigning of individuals, as well as all movements incidental to the assembling of the individuals into units.

War plans are prepared for the conduct of war with all probable enemies. For each of these war plans there is a special strategic plan and a special mobilization plan. The latter gives the necessary instructions for meeting the requirements of the strategic plan. The general mobilization plan for the United States provides for the mobilization of the Army of the United States for national defense. In general there is established an M-day, which is the first day of mobilization.

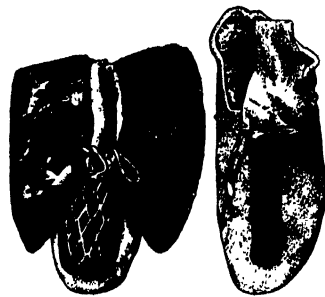
Each corps area prepares a general mobilization plan based upon the War Department plan. Each active unit of the regular army and of the National Guard likewise has a general mobilization plan, based upon the general mobilization plan of the next higher echelon. In the plans prepared by all regular army units provision is made for their movement to the theater of operations on M-day at their existing strength and with all equipment. The active units of the National Guard must be ready for movement to the theater of operations with equipment three days after the mobilization call.

At the time of mobilization full use is required to be made of Federal, state, county and municipal buildings for the shelter of troops and supplies. If public buildings are not available privately owned property will then be used. The care of all troops in so far as food, clothing, shelter and medical attention are concerned, is the function of the nine Corps Area commands into which the United States is divided. S. J.

Navy mobilization, the placing in readiness for active service of all naval forces, is sometimes called a concentration. In war time, it is the passing from a peace to a war footing. In the cases of nations like the United States or Great Britain, it is of vital importance that the period of mobilization be as short as possible. Delay may be the cause of the first setback or defeat and it may endanger the whole sea campaign. The mobilization of the British Fleet in July 1914, had much to do with the later success of their transporting men and material to France. It is the custom, in present days, to have men, active, reserve, or retired, munitions and food stores ready to proceed or be sent to previously designated stations afloat or ashore on the one word to mobilize. War plans make all arrangements to this end. The United States Fleet mobilizes or concentrates its four main forces, battle, scouting, submarine and base force once a year, either in the Isthmus of Panama area, the Caribbean area or the Hawaiian area. R. E. C.

**MOBY DICK** "or The White Whale," a superb novel of the sea by HERMAN MELVILLE; published 1851. This tale of Captain Ahab and his world-wide pursuit of the dreaded white whale, Moby Dick, which in one encounter cost Ahab the loss of a leg, presents a thrilling picture of the whaling fisheries, and may be taken also as a sweeping allegory of man's struggle with the darkest forces of nature and of his own soul.

**MOCCASIN**, the soft skin shoe worn by the North American Indians. With the exception of the tribes along the Mexican border who wore sandals and the Barefoot Indians of southeastern Texas and the Pacific Coast, moccasins were almost universally worn by the Indians. They were of two general types, those with sole and upper fashioned from a single piece of leather with a seam at the instep and heel, and those with



COURTESY AMER. MUS. OF NATL. HISTORY  
MOCCASINS OF THE WINNEBAGO AND  
ARAPAHO INDIANS

a rawhide sole fastened to a soft skin upper. The character of trails, tribal usages, and the presence or absence of animals from which thick rawhide could be obtained were the chief factors influencing distribution of the types. The boot or legging moccasin which extended well up the calf of the leg and even to the hip is still a common type from Alaska south to Arizona and New Mexico and is made either like

a boot or has wide strips of skin wound neatly and methodically around the leg and fastened with a cord. This type is worn as a protection against cold or, as in the southwest, against thorns and is generally made of white-tanned deerskin. Winter moccasins were often made of bear pelts, buffalo skin, or seal-skin, with the fur inside. Moccasins were sewn with sinew thread through holes punched with a fine-pointed awl and were fastened with leather thongs. Single piece patterns for the soft skin type showed great ingenuity, the most complicated pattern being that of the Klamath Indians of southwestern Oregon. Dyes, pigments, beads, quills, cloth, buttons and fur were used for ornamentation, which was frequently elaborate. Moccasins with decoration on the soles were worn by sick persons, participants in ceremonies and by lovers who wished to impress their sweethearts as they danced before them. Many of the decorative forms were very old. They were also highly symbolic and with the distinctive patterns for the actual shaping of the shoe made the moccasin a sort of tribal bondage. Among the Iroquois Confederacy, to put on the moccasin of another tribe meant the acceptance of its laws and customs and the renunciation of previous tribal affiliations.

**MOCCASIN-FLOWER** (*Cypripedium acaule*), a handsome North American orchid called also stemless lady's-slipper. It is found in sandy or rocky woods from Newfoundland to Manitoba and southward to North Carolina and Minnesota. The plant rises from a fleshy fibrous root bearing two large, oblong, basal leaves and a stoutish flower-stalk ending in a single, inflated, moccasin-like pink or white flower. The moccasin-flower, with its conspicuous leaves and drooping fragrant blossoms appearing in late spring, is one of the most attractive wild flowers of the eastern United States and Canada. Minnesota has adopted it as the state flower.

**MOCHA STONE**, called also moss AGATE, a variegated form of CHALCEDONY which is colored by visible impurities. In moss agate there are moss-like or dendritic forms scattered through the stone, usually due to inclusions of manganese oxide. These are black, green or brownish, while the ground-mass may be white, bluish, brown, red and other colors. Moss agates come from Nevada and from certain regions in Germany and elsewhere in Europe. See also DENDRITES.

**MOCKER NUT**, the name given to a species of hickory (*Carya alba*), called also whiteheart or hard-bark hickory, widely distributed in the eastern and southern United States. It is usually a medium-sized tree, but sometimes grows 100 ft. high, with a straight trunk bearing small spreading branches, fragrant leaves and large, thick-shelled, sweet, edible nuts. The wood, similar to that of the shellbark hickory, is one of the most valuable of American hard woods.

**MOCKINGBIRD**, a genus (*Mimus*) of plain-plumaged passerine birds in the same family (*Mimidae*) with the catbirds and thrashers, famous for their

beautiful song and their extraordinary power of imitating the notes of other birds. There are some 20 forms spread generally over South and Central America and the West Indies, a single species ranging northward to the southern United States. The North American mockingbird (*M. polyglottus*), about the size of a robin, is gray above and grayish white below, with the tail and wings blackish marked with white. It is found commonly from Maryland and southern Illinois to the Bahamas and Mexico. Ranging from Oklahoma, Texas and California southward into Mexico, occurs a very similar, but slightly larger form, the western mockingbird (*M. p. leucopterus*). Active, alert and familiar, the mockingbird is usually seen in parks, gardens and city squares, building a bulky nest in hedges or low trees near human dwellings and laying 4 to 6 pale bluish, heavily brownish-spotted eggs. It feeds chiefly upon insects, earthworms and various soft fruits. Its exquisite song, which equals if not surpasses that of the Old World nightingale, is heard continuously throughout the day and often during the night. The remarkable ability to imitate exactly the calls of other birds, from the bluebird to the hawks and jays, as well as various other sounds, varies greatly in individuals. Some mockingbirds have been known to mimic the songs of more than 30 different birds within a period of 10 minutes. Because of their exceptional vocal powers mockingbirds were formerly kept as cagebirds, but this is no longer legal. A. B. J.

**MOCK ORANGE**, a name applied to various plants whose flowers or fruits more or less resemble those of the orange, especially to certain syringas (*Philadelphus* sp.) with large white, sweet-scented flowers. The calabazilla (*Cucurbita foetidissima*) of the southwestern United States, which bears a smooth, nearly spherical, bright-yellow gourd, 3 to 4 in. in diameter, is sometimes called mock orange.

**MODE**, in music, metrical NOTATION used during the Middle Ages, and also the commonly known major and minor modes, so called from the SCALE structures employed. Since about 1700 the latter modes have served the needs of secular music and excepting GREGORIAN CHANT, the needs of most sacred music. A composition is in a minor mode when it uses the minor-scale construction but the scale itself is not a mode, but rather *in* a mode formed of a certain succession of intervals which the mode determines. The same applies to major modes. Greek music interested itself in melody rather than HARMONY; the concern was with tones sounded in succession instead of simultaneously, and thus arose the



G. M. SUTTON. "BIRDS OF PA."

MOCKINGBIRD

seven Greek modes, the Lydian being identical with the major mode to-day and the old Hypodorian system of transposing modes corresponding with the modern descending MELODIC MINOR SCALE.

Early Christian church music borrowed these Greek modes, using the term *modus* in metrical notation to designate the time-signature of compositions. Among the multiple signs used in the Middle Ages, the broken circle, C, the symbol for duple meter, remains as the time-signature for 4-4 or "common" time. The old church modes were divided into authentic and plagal, the latter derived from the former, starting a fourth lower and based on the same sequence of intervals used in the authentic mode. T. Sr.

**MODELING**, that stage of sculpture which consists in the construction of a model in clay, plaster of paris, or wax which is later to be reproduced in bronze, marble, stone, plaster, terra cotta or wood. In relation to the finished work, the model may be executed in reduced, enlarged or true proportions. The hands, the thumb particularly, and the fingers are used as tools in modeling, as well as tools made of wood, wire, ivory and steel. An armature, usually of lead pipe, is constructed to support the finished model, and the clay or other medium is applied in small dabs until the model is completed. When clay is used, it must be sprinkled frequently to keep it moist and it must be covered with a damp cloth when not being worked on. A specially prepared clay composition known as plasticine which does not dry out so fast as clay has been developed. Yellow wax mixed with black resin, terebinth, and oil is used for small models.

Wax has been used for modeling and for finished sculptured objects since earliest Egyptian times. During the reign of Alexander Greek modelers in wax rivaled their brothers in bronze. Wax portraits of the deceased were carried at the head of funeral processions in Roman times. The first known objects to be modeled in clay are the statuette of bison found on the floor of the Tuc d'Audoubert cave in southern France and made by the Cro-Magnons 25,000 years ago.

**MODENA**, the capital of the Italian province and former duchy of the same name, situated in north central Italy. It is the seat of an archbishop, of provincial authorities and of a university founded in the last quarter of the 17th century. The city is well-built, with fine streets and promenades in place of the former walls. In the Grande Piazza in the center of the city near the Via Aemilia, the main street, is the Romanesque cathedral begun 1099 and completed 1184, with a campanile erected 1224-1319. Among the 26 other churches, specially noteworthy are the early Renaissance San Pietro with a fine façade, the Gothic San Francesco, 14th century, and Sant' Agostino, all with sculptures by Begarelli. The most important secular buildings are the former ducal palace, the Albergo Arti, the national bank and the former citadel. The city has advanced and technical schools and valuable libraries, including the Biblioteca Estense with a fine picture gallery. The chief manufactures

are agricultural implements, surgical instruments, bicycles, baskets and hats. Modena does a brisk trade in agricultural products. The ancient Etruscan city, *Mutina*, Modena was captured by Constantine in 312, was in Frankish times the seat of a county, and in the 10th century a possession of the house of Canossa. A free city in 1115, it surrendered to Margrave Obizzo of Este in 1288, and in 1598 became the residence of the newly created dukes of Modena. Pop. 1931, 92,757.

**MODERN ARCHITECTURE.** The last decades of the Renaissance were marked by a growing interest in ancient art. When the French and American revolutions ushered in the modern industrialized world and swept away the last vestiges of Renaissance tradition, it was inevitable that the new architecture should be based on that of ancient Rome. (See ARCHITECTURE, HISTORY OF: Modern Architecture.)

**Roman Revival.** *In America.* Even before the American Revolution, Thomas Jefferson (1743-1826) had used his own house, Monticello, as an experiment station in which to test his architectural theories. More and more he was led from Georgian forms to those of ancient Rome. In his designs for the Virginia capitol at Richmond, made in France in 1785, the classic temple form was for the first time adopted for a modern public building. Even in New England, where Georgian traditions were stronger, the Roman influence gradually crept in. Much of the work of Samuel McIntire shows the struggle between the Georgian and the classic. For example, the Pierce-Nichols house, about 1780, has classic, monumental exterior detail and dainty, carved, Georgian interior woodwork. Charles Bulfinch, in Boston, adopted the Roman manner more completely; both the great dome of the Massachusetts State House, 1795-98, and the delicate restraint of his Lancaster meeting house, 1817, are characteristic of his scholarly taste.

A somewhat similar taste characterizes much of the work of John McComb in New York. The exquisite Louis XVI delicacy of the New York City Hall, 1802-09, designed by him and the French architect, J. F. Mangin, is an exception. In the outlying districts of New York State and Ohio, local variations of the Colonial style continued to develop, such as the "Dutch Colonial" fans and oval ornaments of New York. More pretentious houses, however, all over the East became more and more quiet, severe and monumental, like Thornton's Tudor house in Georgetown, D.C., about 1810, or the Gore house, Waltham, Mass., about 1800, attributed to Bulfinch. The two-story colonnades of post-revolutionary Southern plantation houses are evidence of an equal though different, pursuit of Roman grandeur.

This growing Romanism of taste was given a magnificent expression in the buildings of the new capital city, Washington. President Washington shared Jefferson's Roman enthusiasm, and the new national Capitol, begun by Dr. William Thornton and continued by Hallet, Latrobe and Bulfinch to its first completion, 1792-1830, was naturally in a classic Roman



style. In it the American capitol type, two wings flanking a rotunda with a dome, was definitely set, and influenced the design of many state capitols for over 100 years. Its influence upon European governmental buildings is also widespread. Even as late as the 1850's, when the capitol was enlarged by the present Senate and House wings, the architect, Thomas U. Walter (1804-87), preserved the Roman character intact, and in the great dome which he added produced one of its most striking examples. The climax of the academic Roman revival in America was reached in the group for the University of Virginia, designed by Thomas Jefferson, 1817-27, and its library, known as the Rotunda, was definitely based on the Roman Pantheon.

*In France.* Roman character had been achieved under Louis XVI in the Bordeaux Theater by Victor Louis, 1753-80, and in Soufflot's Panthéon at Paris, 1764-90; but it was the court of Napoleon which made the Roman fashion universal. His court architects, Percier and Fontaine, created an effective Romanized interior decorative style (see EMPIRE STYLE) and popularized it by many publications. In architecture, their triumphal arch of the Caroussel, 1805, is typical in its aping of the Roman arch of Constantine. Four important buildings reveal the characteristics of this Napoleonic architecture. The colonnade of the Chambre des Députés, by Poyet, is enormous in scale, well detailed, with great unbroken stone walls, but has little relation to the building behind it. The Bourse, by Brongniart, has a similar parade of Corinthian columns; but the building as a whole is more closely organized, and logical as well as monumental in conception. The finest building in the style is undoubtedly Chalgrin's Arch of the Étoile, in Paris, 1806-36. This arch, 160 feet high and 150 feet wide, has achieved Roman grandeur and enormous impressiveness, without columns or archaeological details. The Madeleine, by Vignon and Huvé, 1806-42, even though it was originally built as a national memorial shrine, is at best two unrelated buildings: a domed interior, Byzantine in scheme, and a gabled exterior like a Roman Corinthian temple. Archaeology has triumphed over design, and the theory that beauty lies in correctness of detail has blinded the designers to the basic lack of harmony. An architecture so based was necessarily sterile, and with Napoleon gone the Roman revival died, leaving, however, something of the dignity of Roman planning as part of the continuing tradition of French architecture.

*In England.* The classic Roman influence found in the late 18th century work of the Dances (1695-1768, 1741-1825), Gandon (1742-1823), Paine (1725-89) and Robert Adam (1727-92) still retained much of the native Georgian tradition. George Dance the Younger, in the Fleet Street Prison, London, now destroyed, showed genuine imagination in his use of bold, rusticated masonry and Roman simplicity. ROBERT ADAM was more deeply learned in Roman form; he had measured and published Diocletian's Palace at Spalatro, but he was too much the architect to allow ar-

chaeology to dominate him. Only later, when Greek forms were already popular, was archaeology supreme in England, and true Roman revival work is therefore scarce. Its two main examples are Bassey's Fitzwilliam Museum at Cambridge, 1845, and St. George's Hall at Liverpool, by H. L. Elmes, 1809-46. The latter is magnificent in scale and masterly in plan.

*In Other Countries.* Throughout Europe, the Roman revival followed Napoleon's eagles. In Italy it enjoyed a brief period of great productiveness. The sentimental classicism of Canova's sculpture was immensely popular and helped spread the Roman taste. The chapel tomb, which he had built for himself in Possagno by G. A. Selva, is characteristic in its unthinking use of archaeological forms. The Arco della Pace in Milan, 1806-38, by L. Cagnola is an impressive modern interpretation of Roman prototypes; but the most successful work of the Italian Roman revival is the domed church of San Francesco di Paola, 1817-31, in Naples, by P. Bianchi, where the archaeological forms are used in a fresh and creative manner.

In Germany, the Roman revival remained sporadic. Hatred of Napoleon undoubtedly worked against the use of Roman inspiration. Schinkel and others in Berlin, and Gärtner in Munich, used occasional Roman elements. Pompeian work influenced some of the Biedermeier interiors, but seldom save in the Munich triumphal arch, 1843-50, by Gärtner and Metzger, was there direct copying of Roman buildings.

**Greek Revival.** *In Germany.* Once the revivalist attitude in modern architecture had become current, a Greek revival was inevitable. The first volume of Stuart and Revett's *Antiquities of Athens* appeared in 1762; Winckelmann had differentiated Greek and Roman sculpture about the same time. Thus knowledge of Greek forms, of the Greek spirit, was growing, and in Germany an archaeological turn of mind combined with an instant appreciation of Greek beauty to make the Greek inspiration supreme. In the Brandenburg Gate, in Berlin, by K. G. Langhans, 1784, the aim is already to produce a Greek propylaea, despite misunderstood detail. From the fall of Napoleon in 1815, down to the middle of the century, the Greek revival was at its height. F. Schinkel (1781-1841), like Chalgrin, nowhere attempted the mere copying of Greek buildings; he was always more architect than archaeologist. In the Berlin Court Theater he treated the many windows in the boldest and most direct way, and even his austere Hauptwache has its Greek details much modernized. The Nikolai Church in Potsdam is equally original, though less successful in scale; and his masterpiece, the Altes Museum in Berlin, is superb in the relationship of its long colonnade to the higher walls behind and the open space in front. The more archaeological work of L. Von Klenze (1784-1864) in Munich seems by contrast pompous and artificial. His Ruhmeshalle in Munich, with its stolid, colossal statue of Bavaria, by Schwanthaler, and his Valhalla near Regensburg, based on the Parthenon, are both typical in the cold and academic starkness which results from bad sculpture and lack of color.

Von Klenze's two Munich art galleries, the Glyptothek and the Pinakothek, are freer and more attractive. In Vienna, the Parliament House, by the Dane, T. Hansen (1813-91), is a late example of a Greek revival spirit; its great scale and impressive situation make it one of the best modern Greek-inspired buildings. Hansen was also the architect of the University at Athens, where Greek detail and rich color are used simply and directly with good effect.

*In Russia and Scandinavia.* Both Russia and Scandinavia also felt the impact of the Greek revival. Many delightful villas around St. Petersburg (Leningrad) show with what freedom and charm the Greek inspiration can be used. In the larger and more monumental works, like the Hermitage Museum, by the Bavarian Von Klenze, the academic quality is obtrusive. The Scandinavian work still shows the effect of late Renaissance tradition, and the archaeological details are usually handled with creative freedom. The Thorwaldsen Museum, by M. G. Bindesböll (1800-56), and the Vor Frue Church, by Frederick Hansen (1756-1845), both in Copenhagen, are typical; the latter is especially interesting in its combination of Roman arches and apse with a Greek Doric colonnade.

*In England.* The Englishmen, Stuart and Revett, had been the first to publish the ancient Greek buildings under the auspices of the Society of Dilettanti; at the time of the Greek War of Independence, the whole of intellectual England went Greek mad as the expedition of Byron to Greece showed. Naturally, Greek architecture was revered in a sentimental manner not entirely dead to-day; its "purity," austerity and refinement were acclaimed as the summit of human perfection. The English architects of the time too often approached design with an equally sentimental attitude; the fallacy that detail and ornamental forms constitute architecture was rampant. Thus the greater number of Greek revival works are successful only as decorations, like Sir Robert Smirke's Ionic colonnade of the British Museum in London, which is a positive detriment to the building behind it. The Church of St. Pancras, London, by the two Inwoods, is an exception, and its combination of elements from the Erechtheum and the Tower of the Winds at Athens into what is essentially a Georgian church scheme is effective. Somewhat similar free combinations of Greek detail are common in Scotch work, such as the High School at Edinburgh, by Thomas Hamilton (1784-1858). The freer work of Sir John Soane (1753-1837), though frequently using Greek details, is never revivalist and will be dealt with later.

*In America.* The United States was even more interested in the cause of Greek freedom than England, and the same spirit that scattered towns named Athens, Sparta and Troy throughout the country eagerly appropriated the Greek forms that Latrobe had used tentatively in the United States Capitol as early as 1800. In the Second Bank of the United States, in Philadelphia, 1819-24, now the Customs House, Latrobe created an eight-column Doric portico based

on the Parthenon; from then on the Greek influence was supreme. Robert Mills (1781-1855), in the Treasury Building at Washington, and William Strickland (1787-1854), in the Tennessee Capitol at Nashville and the Maritime Exchange at Philadelphia, used the Greek inspiration in a free and creative way quite different from the contemporary or English manner. Further north, Ithiel Town, A. J. Davis, Minard Lefever, Isaiah Rogers, and others achieved an equal skill in the same kind of free variation: e.g., the old Connecticut Capitol at New Haven by Town, 1828; the New York Customs House, now the Sub-Treasury, by Town and Davis and John Frazee, 1832; the New York Merchants Exchange, now the lower part of the National City Bank, by Isaiah Rogers. So popular was the style, known widely from books by Asher Benjamin, Minard Lefever and others, that every frontier town in Ohio and Michigan had its Greek revival courthouse almost as soon as the forest was cut down. Everywhere, door casings, mantels, church pews and pulpits, window treatments, and tiny porticos followed the beautifully drawn plates of these books. Yet there was one great difference between this popular American work and the revival work abroad; for the American designs almost always were architectural rather than archaeological, and the white houses and churches were decked with, rather than smothered under, archaeological forms. It was the more pompous buildings, like Girard College in Philadelphia, by Thomas U. Walter, with its elaborate Corinthian order, which were least successful; the minor work had a vitality that kept the style alive down to the Civil War. The Ridgeway Branch Library, at Philadelphia, built in the 1870's, is a belated example of the Greek revival rather than a work of modern eclecticism.

*Medieval Revivals.* *In England.* The Middle Ages have appealed to the romantic mind ever since the 18th century, and even in the bewigged Georgian period Thomas Chippendale and Batty Langley had occasionally used Gothic forms as inspiration, though ignorantly. This early and literary medievalism reached a climax in the work, both literary and architectural, of the extraordinary HORACE WALPOLE. In his own house, Strawberry Hill, he was constantly busy from 1754-80 making alterations in the new Gothic vein, which, however grotesque, showed a deeper knowledge of Gothic detail than that of Chippendale or Langley. Strawberry Hill won immediate fame and was at times open to the public like a museum. To it primarily was due the first phase of the English Gothic revival, the so-called "castellated" Gothic. House after house, between 1790 and 1840, was built in this new style by the romantic nobility who followed Walpole's lead. In them, effect was everything; scale, propriety and construction were of little account. Miniature battlements, wood-mullioned windows, wooden tracery elaborate and structurally impossible, and tracery-ribbed vaults used decoratively in plaster, all marked the style. The most amazing example, both as a brilliant design as well as a piece of romantic absurdity from any practical standpoint,

was the superbly picturesque Fonthill Abbey, designed about 1796 by Wyatt for the eccentric author, William Beckford. Its great tower, over 200 feet high, framed of timber though imitating masonry, crashed down some 30 years later, destroying most of the elaborate pile as though symbolic of the inevitable passing of a style so sentimental.

Yet the medieval interest persisted and grew, and a sounder architectural basis than Walpole's eccentricities was soon found, for serious archaeological investigations of medieval architecture had begun. Augustus Charles Pugin (1762-1832), a French draftsman settled in England, was publishing the earliest numbers of the famous series of illustrated works on English Gothic remains so brilliantly carried on by his son, the architect Augustus Welby Pugin (1812-52). And by 1817 Thomas Rickman (1776-1841) had published *An Attempt to Discriminate the Styles of Architecture in England*. To this background of sound archaeological study and the vague medievalism of the Romantic Movement, there was added the influence of the Oxford Movement, about 1833-40, with its insistence on traditional authority in church dogma and ritual, and its equally enthusiastic support of Gothic architecture as *the* Christian architecture and thus the only proper architecture for a Christian country. The Gothic revival movement swept over England like a deluge; characteristically, Queen Victoria ordered Sir Charles Barry to change his design for the Westminster House of Parliament, 1837-43, from the classic he advocated to the Gothic she felt fitting.

The Gothic revival was at first ecclesiastical and archaeological. Its best productions were parish churches. Typical examples are the additions to the Cathedral of St. George at Southwark, London, and Killarney Church in Ireland, both by A. W. Pugin; St. Mary Abbots, Kensington; St. Mary's Cathedral, Edinburgh; St. Nicholas in Hamburg, Germany, all by Sir Gilbert Scott; and the nave of Bristol Cathedral by G. E. Street. Most of these followed Early English or Decorated Gothic models. The great fault of the style was lack of scale. Town parish churches were sometimes made as nearly like cathedrals as possible, and the temptation to use all the Gothic tricks on even a small building was often too great for the architect to withstand. Where there was no direct medieval precedent, as in modern secular buildings, the results were often confused and ineffectual, like St. Pancras Station and Hotel, London, by Sir Gilbert Scott, and the London Law Courts by G. E. Street.

The later Gothic revival of 1850-80 was largely under the influence of RUSKIN (1819-1900). The wide acceptance of his writings, *Seven Lamps of Architecture*, 1849, and *Stones of Venice*, 1851, due to the persuasive beauty of their mystical approach to architecture, stimulated and popularized his enthusiasm for the Italian Gothic, and turned the people away from the mere archaeological copying of English medieval forms. Polychromy, the honest expression of materials, and a free use of Gothic ornament combined in new ways marked this later phase now

usually termed Victorian Gothic. Characteristic examples are the buildings of the Assize Courts and the City Hall of Manchester, both by Alfred Waterhouse (1830-1905).

*In America.* The American architectural movement was largely a mirror of the English. Even the early "castellated" work was reflected in the United States before the War of 1812, in many localities, and in 1815 the first St. Patrick's Cathedral in New York was designed in the Gothic style by the French architect, J. F. Mangin. From 1830 on, the Gothic style became more and more popular and was used with greater correctness, especially in church work. This more correct archaeological Gothic Revival was largely the result of the work of Richard Upjohn (1802-78), an English architect who settled permanently in America. It was popularized by a flood of newspaper and magazine articles supporting the English idea that the Gothic style was the only really Christian architecture. Upjohn's best known work is Trinity Church in New York. He had many American followers, who showed a surprising ability in understanding and adapting the Gothic forms; James Renwick (1818-95) in the 40's designed the lavish and delicate Grace Church in New York and, later, the monumental St. Patrick's Cathedral, which combines French, German and English details. Minard Lefever (1797-1854) was another prolific architect in this style.

Similarly, the Victorian Gothic polychrome masonry, stumpy columns, Italian details, and attempts at freedom became common in America. Ware and Van Brunt's Alumni Hall at Harvard and the State Capitol at Hartford, Conn., by Richard M. Upjohn (1828-1904), are characteristic monuments. There was also a naïve country craftsman Gothic, which imitated stone tracery and buttresses in wood, often modifying forms to fit the material, and sometimes, like the country Greek Revival, achieving a valid, if old-fashioned, beauty.

*In Germany.* The German Medieval Revival was under many influences. German romanticism for a long time persisted in its original Greek enthusiasm; yet even Schinkel had experimented with Gothic forms, as seen in his National Monument, Berlin. Italian influence was strong in Bavaria. At the same time a new romantic nationalism, like that which inspired Richard Wagner's *Nibelungenlied*, produced the restoration of the great Romanesque Wartburg Castle, the completion of Cologne Cathedral, and the tower at Ulm; a more playful manifestation can be seen in the Bavarian court mock-heroics, such as the picturesque castle of Neuschwanstein, 1869, by Dollmann, Riedel and Hoffmann.

*In France.* France, like Germany, never completely surrendered to the Gothic Revival, although it was a French architect, EUGÈNE VIOLETT-LE-DUC, who was its most thorough and scientific student. His very thoroughness and his insistence on the structural basis of the style combined with the creative tradition of the *École des Beaux Arts* to discourage superficial copying, although it led to magnificent if

occasionally arbitrary restoration works. When actual new building in Gothic was attempted, like *Ste. Clothilde*, Paris, 1846-56, by Gau, or the west front of *St. Ouen* at Rouen, 1848-51, by Viollet-le-Duc, the correctness of archaeological knowledge was a detriment to design and led to dry and uninspired work.

As a result, many French architects turned to other medieval styles, like Romanesque and Byzantine, as more susceptible of development. *St. Martin* at Tours, by Laloux, the cathedral at Marseilles, by Vaudoyer, *Esperandieu* and *Révoil*, and *Sacré Coeur*, in Paris, by Abadie and Magne, are examples of this inspiration. In *St. Augustin*, Paris, 1860-71, by Baltard, medievalism is so cloaked in modernity that nothing of the revivalist attitude remains. Meanwhile, a popular, romantic medievalism was developing the typical French villa, with its high roof and clutter of inexpressive details.

**Revolts Against Revivalism.** Schinkel in Germany, Soane in England, Latrobe and Lefever in America were too much creators to allow design to be dictated by archaeology. Sir John Soane, both in his books of small house designs and in the interiors of his Bank of England in London, is always the creator rather than the student. Lefever's books show endless creative variations from precedent; and the later books of Asher Benjamin and the late works of Bulfinch are equally free.

In France, the creative spirit of the *École des Beaux Arts* insured a strong foundation for this revolt. The result was a great rationalistic movement, displayed alike in the *Néo-Grec* work of Duc (1802-79), Duban (1797-1870), Labrousse (1801-75) and Hittorf (1793-1867), and the writings of the Gothicist, Viollet-le-Duc. *Néo-Grec* designers sought not to imitate Greek details, but to design with similar honesty, directness, delicacy and refinement, with adequate expression of new materials. Duc's wing of the *Palais de Justice*, Duban's *École des Beaux Arts*, and Labrousse's National Library and Library of *St. Geneviève*, all in Paris, are typical of this combination of rationalism and classicism. Hittorf's Northern Railway Station, in Paris, with its bold use of glass and iron, went even further in the frank use of new materials for a new problem. *Néo-Grec* ornament was much and badly copied; its spirit was too advanced for imitation.

The increasing use of glass and iron led to other rationalist developments. The London Crystal Palace, 1851, by Joseph Paxton, and the New York Crystal Palace, 1853, by Carstensen and Gildemeister, were epoch-making in their entire abandonment of historical detail, and similar forms appeared in the Paris Exposition buildings in 1869. In the *Halles Centrales* and other markets in Paris, by Ballu and others, the same search for new forms appeared. The movement achieved a climax in ecclesiastic architecture in the Church of *St. Augustin* in Paris, by Baltard; its bold use of iron, glass and terra cotta was an attempt to create a church as expressive of the 19th century as the great Gothic cathedrals were of theirs.

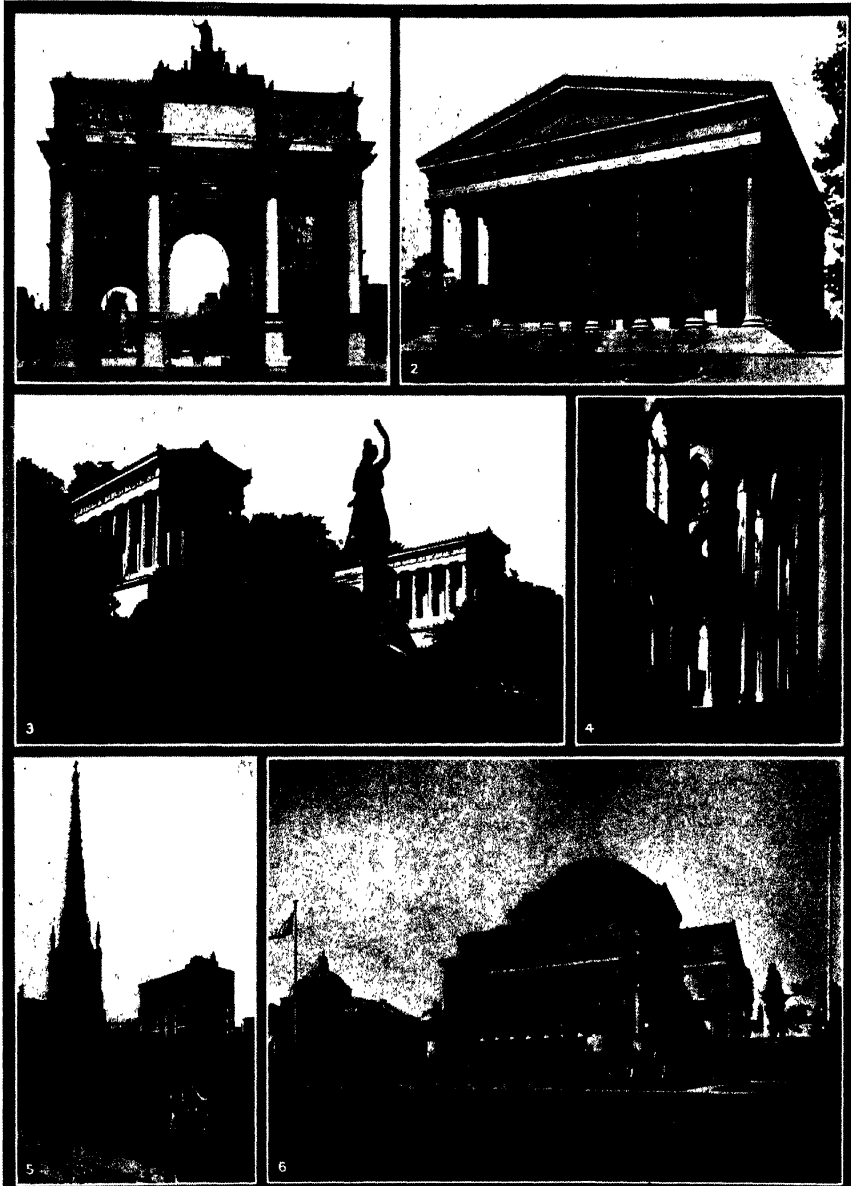
Even the Victorian Gothic sponsored by Ruskin was full of rationalist ideas. Its ethical insistence on honesty led naturally to modern forms for modern buildings. The craftsmanship movement of William Morris (1834-96) and the Pre-Raphaelites was also hostile to revivalism. In America, the work of H. H. Richardson (1828-86) reveals a similar attempt to express modern materials and problems, although his style is distantly based on French Romanesque. His best work, such as the Ames Memorial in Massachusetts, the Pittsburgh Courthouse and Jail, and his later houses, always show this search for honest creation.

**Eclecticism.** Much of this rationalism was too theoretical for popular acceptance, yet it led inevitably to the universal breaking down of unthinking revivalism. As a result, a universal eclecticism developed, aided by the growing production of cheap architectural books and the growing use of photographs in illustrating them. Knowledge of all the past styles was easy to obtain; what more natural than to pick and choose among them? Thus there was a general turning to Renaissance styles throughout Europe, and in this new Renaissance work artistic consistency, rather than historical correctness, was the criterion; motives from different styles were often used in the same building. In France this eclecticism was handled with traditional good taste, monumental planning, and beauty of detail. The so-called National Classic of France which resulted and which ruled French taste during the last quarter of the 19th century made Paris the architectural delight it is to-day. The *Nouveau Louvre*, 1852-57, by Visconti and Lefuel, is an early example of this Renaissance eclecticism; the Paris Opéra, 1861-74, by Charles Garnier, is a later example of more Baroque taste. This French eclecticism was mimicked in the Balkans, South America, England and especially the United States; and architectural students from all over the world went to Paris to absorb the French combination of sound planning and rich, if reminiscent, detail.

In Germany, the close of the Franco-Prussian War introduced a period of exuberant building in a particular type of Baroque that became the quasi-official style of the New Empire. Although the university buildings were generally quiet and dignified, in theaters and such buildings as the Kaiser's Palace in Strassburg or the Parliament Building in Berlin the style ran riot, with ugly square domes and detail often eccentric and ostentatious. The theater of Frankfurt am Main is characteristic.

The classic eclecticism of England took two forms. The first, general in city work, both public and commercial, is characterized by a multiplicity of motives, the avoidance of plain wall, and the use of many Baroque elements, as in the Government Buildings, Whitehall, in London, by Sir Gilbert Scott and others. The other phase consists in the free use of simple Georgian elements, especially for country houses, as in the charming work of Norman Shaw (1831-1912) and some of the earlier houses of Sir Edwin Lutyens (1869- ). Meanwhile, equally free adaptations of

## MODERN ARCHITECTURE



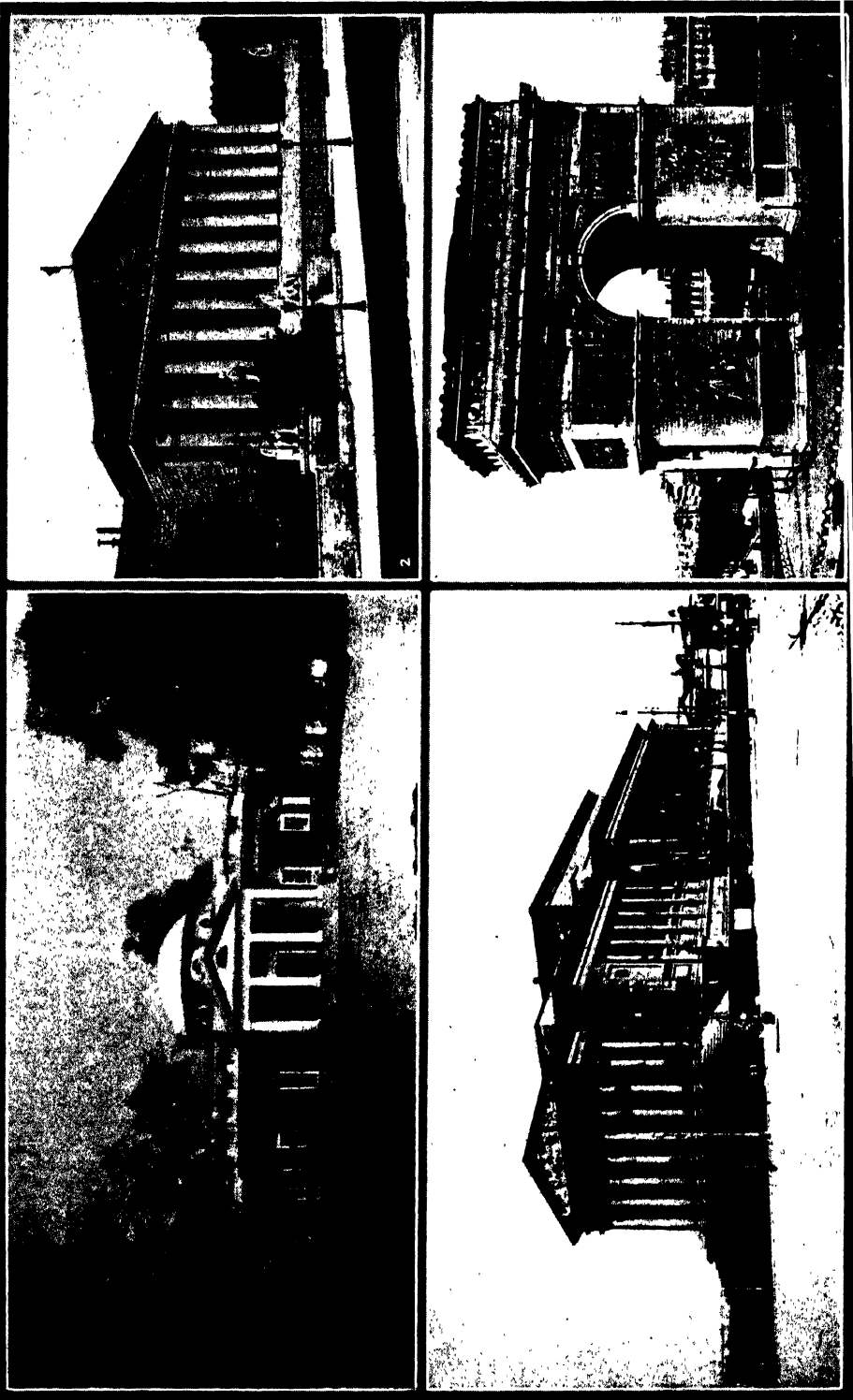
1, 4, 6. PHOTOS FROM PUBLISHERS' PHOTO SERVICE; 2. KEYSTONE VIEW CO. PHOTO; 3. COURTESY GERMAN TOURIST INFORMATION OFFICE, NEW YORK; 5. EWING GALLOWAY PHOTO

### REVIVALISM IN NINETEENTH AND TWENTIETH CENTURY ARCHITECTURE

1. Roman revival: Arch of Triumph of Carrousel, Paris. Percier and Fontaine, Architects. 2. Greek revival: Girard College, Philadelphia. Thomas U. Walter, Architect. 3. Greek revival: The Hall of Fame, Germany. L. von Klenze, Architect. 4. Modern Gothic revival: Central nave of the

Cathedral of St. John the Divine, New York. Cram and Ferguson, Architects. 5. Gothic revival: Grace Church, New York. James Renwick, Architect. 6. Seth Low Memorial Library, Columbia University, New York. McKim, Mead and White, Architects.

## MODERN ARCHITECTURE

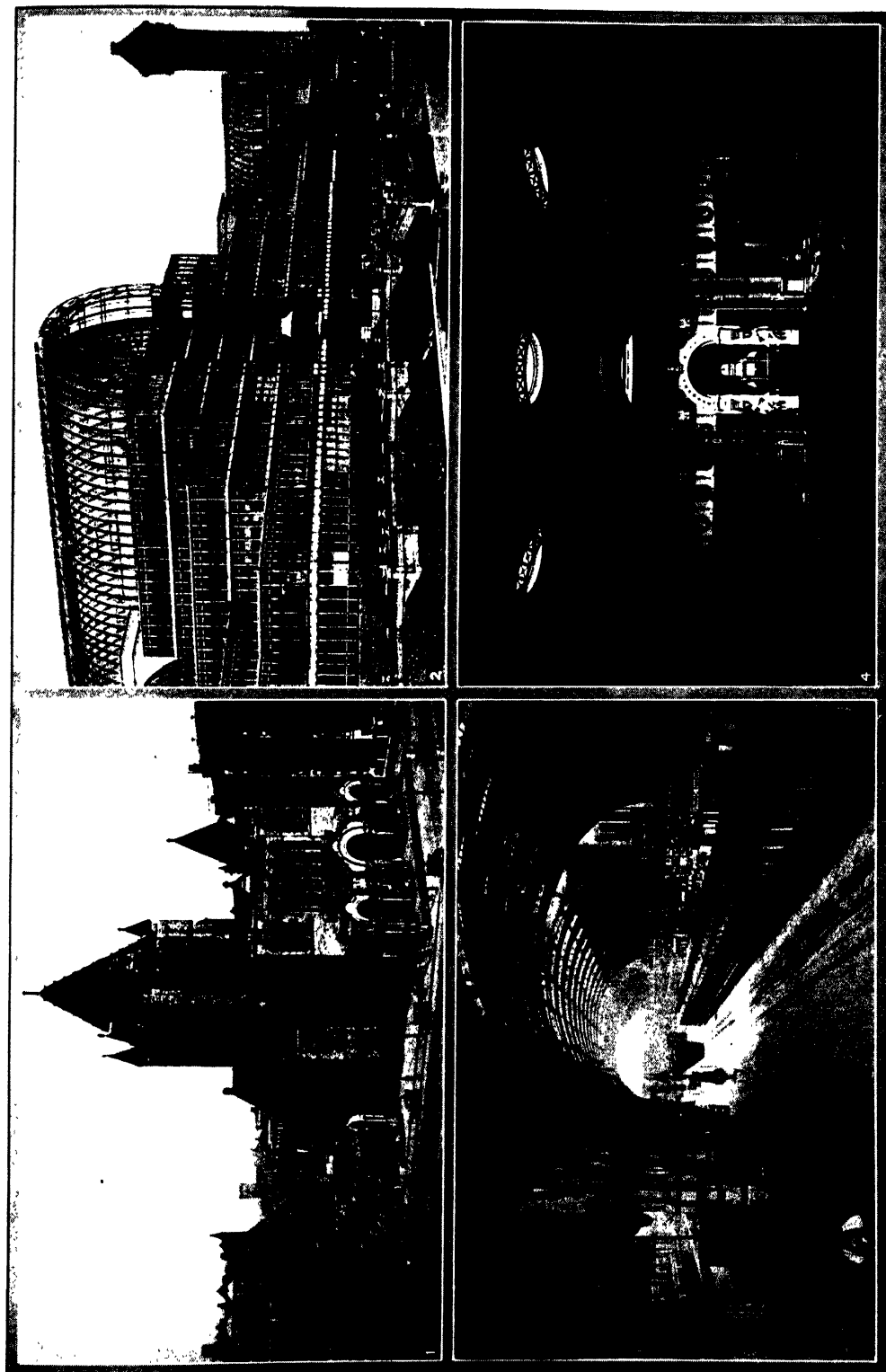


WEST PORTICO OF MONTICELLO, NEAR CHARLOTTESVILLE, VA., THE HOME OF THOMAS JEFFERSON, BUILT BY HIMSELF FROM HIS OWN DESIGNS. BEGUN ABOUT 1769, IT DID NOT TAKE ITS PRESENT FORM UNTIL WELL INTO THE 19TH CENTURY. 2. PORTICO OF THE CHAMBRE DES DÉPUTÉS, PARIS, ADDED TO THE EXISTING STRUCTURE DURING THE REIGN OF NAPOLEON I, A CHARACTERISTIC EXAMPLE OF ROMAN REVIVAL MAGNIFICENCE. POYET, ARCHITECT. 3. ST. GEORGE'S HALL, LIVERPOOL, 1838-54, AN EXAMPLE SHOWING BOTH GREEK AND ROMAN INFLUENCE. H. L. ELMES, ARCHITECT (COMPLETED BY COCKERELL). 4. ARC DE TRIOMPHE DE L'ÉTOILE, PARIS, BEGUN IN 1805, SHOWING A FREER AND MORE CREATIVE USE OF THE ROMAN PRECEDENT. CHALGRIN, ARCHITECT.

### REVIVALISM IN AMERICAN, FRENCH AND ENGLISH ARCHITECTURE

West portico of Monticello, near Charlottesville, Va., the home of Thomas Jefferson, built by himself from his own designs. Begun about 1769, it did not take its present form until well into the 19th century. 2. Portico of the Chambre des Députés, Paris, added to the existing structure during the reign of Napoleon I, a characteristic example of Roman Revival magnificence. Poyet, Architect. 3. St. George's Hall, Liverpool, 1838-54, an example showing both Greek and Roman influence. H. L. Elmes, Architect (completed by Cockerell). 4. Arc de Triomphe de l'Étoile, Paris, begun in 1805, showing a freer and more creative use of the Roman precedent. Chalgrin, Architect.

# MODERN ARCHITECTURE

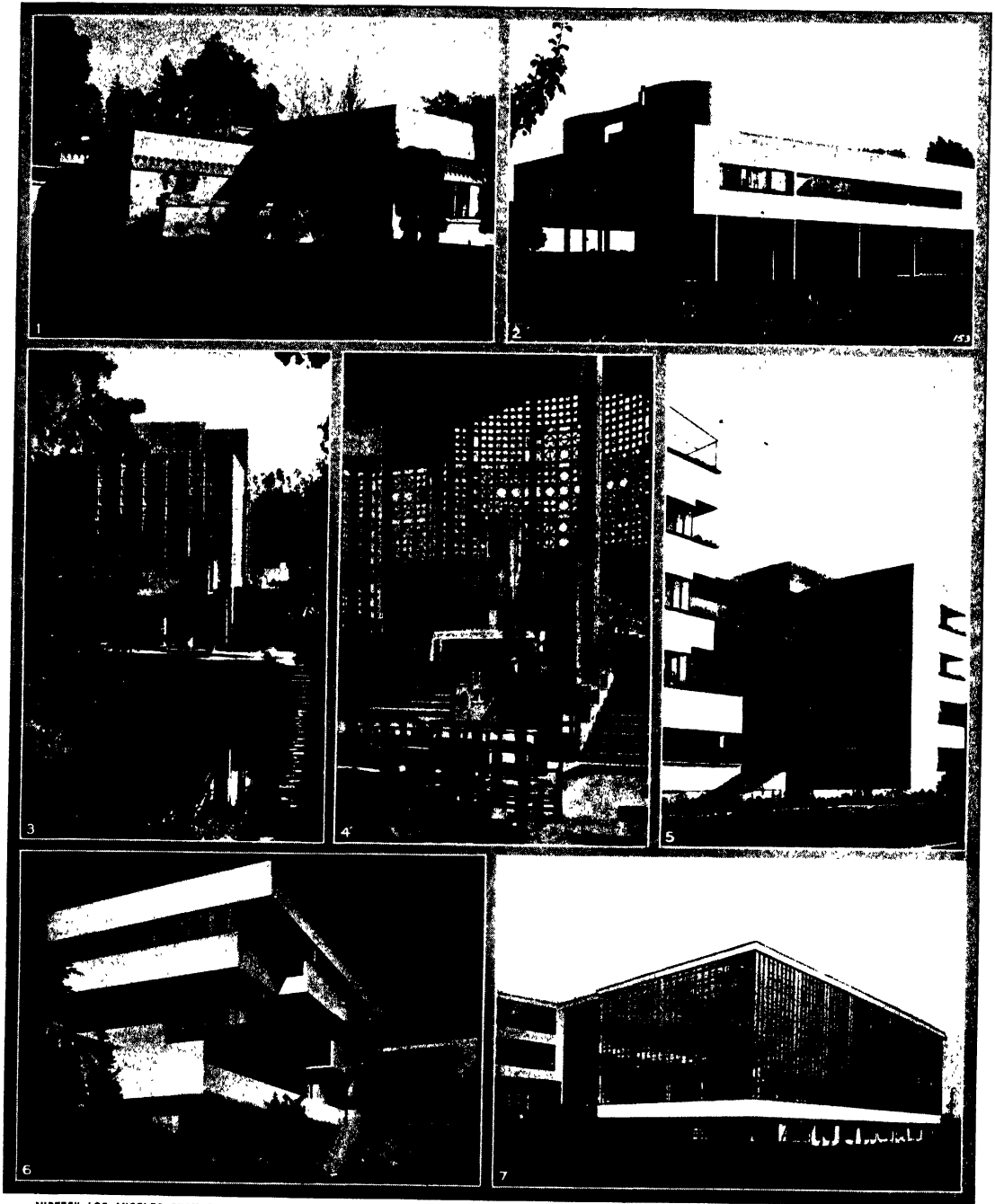


1. EWING GALLOWAY PHOTO; 2, 3. PUBLISHERS PHOTO SERVICE PHOTOS

## RATIONALISM IN NINETEENTH CENTURY ARCHITECTURE

1. Trinity Church, Boston, Massachusetts. 1878. H. H. Richardson, Architect.
2. The Crystal Palace, London, constructed entirely of glass and iron. 1854. Sir Joseph Paxton, Architect.
3. Paddington Railway Station, London. Sir Gilbert Scott, Architect.
4. Reading Room, Bibliothèque Nationale, Paris. Henri Labrousse, Architect.

## MODERN ARCHITECTURE



COURTESY LOS ANGELES CHAMBER OF COMMERCE; 2, 3, MUSEUM OF MODERN ART; 4, 5, 6, RICHARD J. NEUTRA, ESQ.; 7, GERMAN TOURIST INFORMATION OFFICE

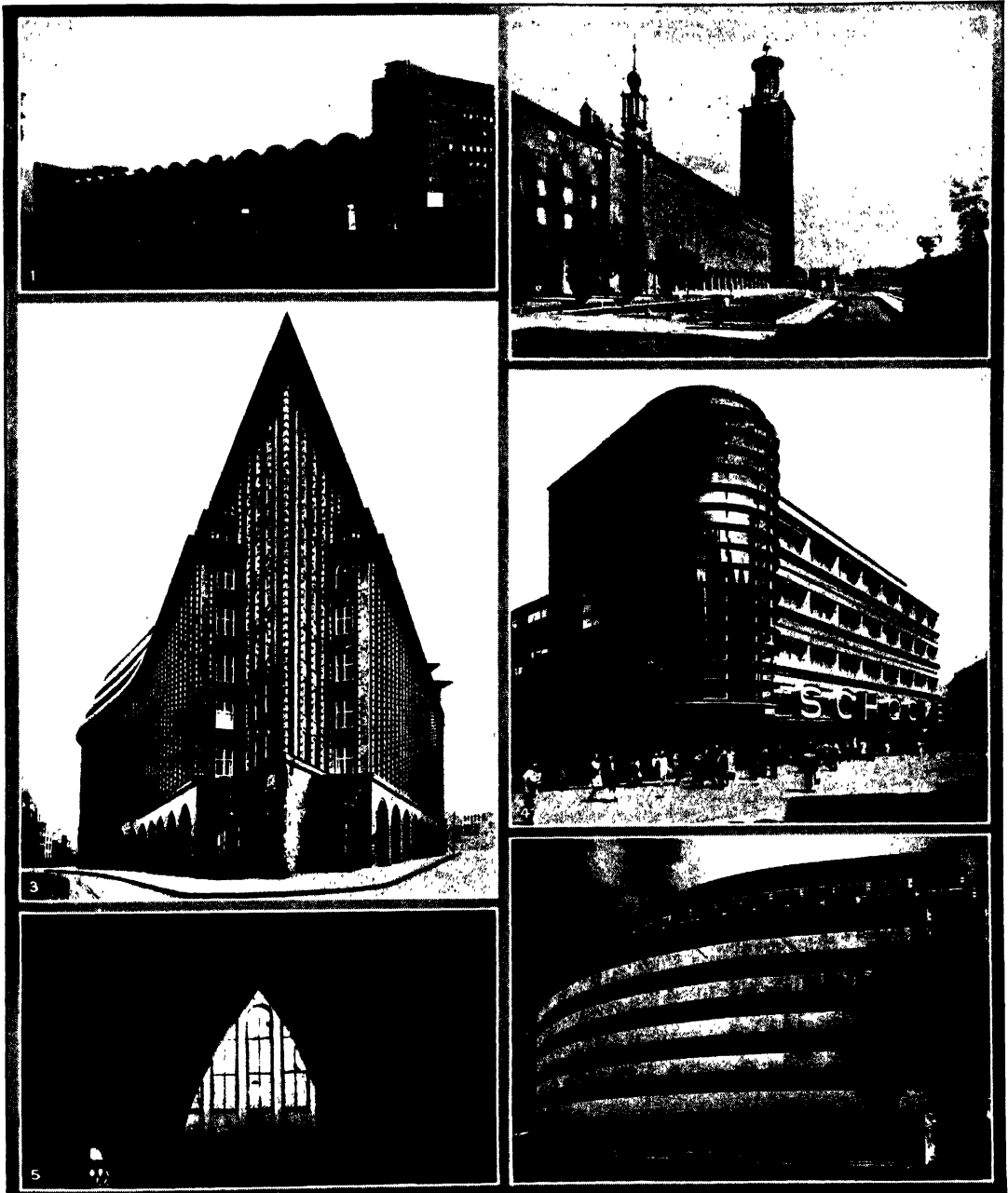
### MODERN ARCHITECTURE IN AMERICAN AND EUROPEAN BUILDINGS

1. California Arts Club, Los Angeles, California. Frank Lloyd Wright, Architect. 2. Savoye House, Poissy-sur-Seine, France. Le Corbusier and Pierre Jeanneret, Architects. 3. Millard House, Pasadena, California. Frank Lloyd Wright, Architect. 4. Interior of the church, le Raincy,

France. Perret Brothers, Architects. 5. Apartment house with gardens, Los Angeles, California. Richard J. Neutra, Architect. 6. Residence, Los Angeles, California. Richard J. Neutra, Architect. 7. Shop building of the Bauhaus, Dessau, Germany. Walter Gropius, Architect.



## MODERN ARCHITECTURE



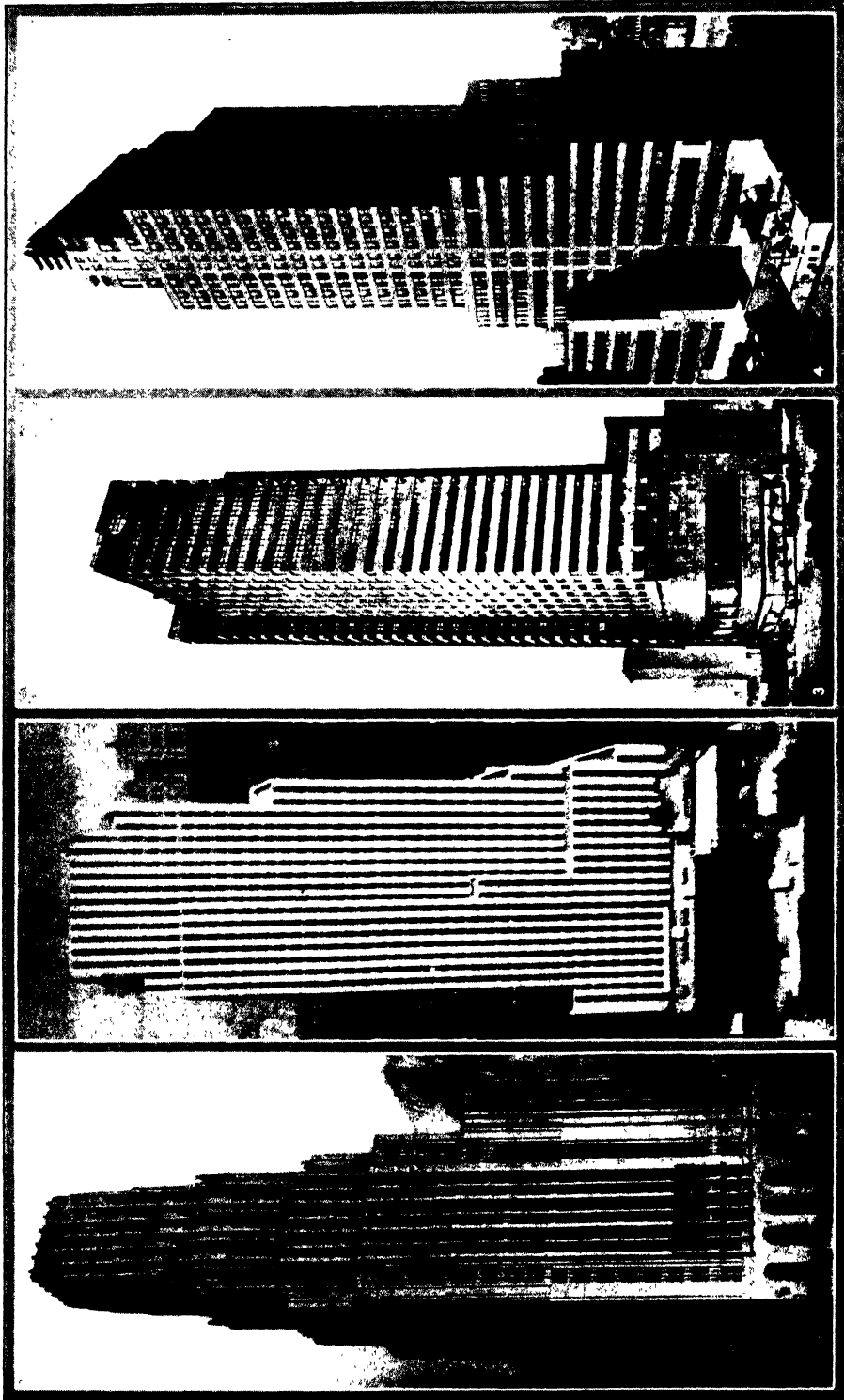
1. BY BURTON HOLMES, FROM EWING GALLOWAY; 2. COURTESY SWEDISH STATE RAILWAYS; 3. 4. 6. GERMAN TOURIST INFORMATION OFFICE;  
5. BY BEHM, FROM ORIENT AND OCCIDENT

### MODERN ARCHITECTURE IN THE CITIES OF EUROPE

1. Municipal Market Building, Frankfurt-on-Main, Germany. Martin Elsaesser, Architect. 2. The Town Hall, Stockholm, Sweden. Ragnar Östberg, Architect. 3. The Chile House, Hamburg, Germany. Fritz Höger, Architect. 4. Kaufhaus Schocken, a department store of Stuttgart,

Germany. Erich Mendelsohn, Architect. 5. Detail of the modern church of New Ulm, across the Danube from Ulm, Germany. Dominicus Böhm, Architect. 6. Kaufhaus Schocken, a department store of Chemnitz, Germany. Erich Mendelsohn, Architect.

# MODERN ARCHITECTURE



1. COURTESY CHICAGO TRIBUNE; 2. REUMAN PHOTO, FROM R. I. RESNETH AND ASSOCIATES; 4. EWING GALLOWAY PHOTO

## MODERN SKYSCRAPER OFFICE BUILDINGS

1. Eliel Saarinen's rendering of an office building, receiving second prize in the Chicago Tribune Competition, 1922.
2. The Daily News Building, New York, 1930.
3. Philadelphia Saving Fund Society Building, 1931. Howe and Lescaze, Architects.
4. McGraw-Hill Building, New York, 1931. Raymond Hood, Architect.

Jacobean and Tudor motives were used in domestic work, and a Gothic eclecticism replaced revivalism in ecclesiastical architecture and is still a vital movement to-day. Liverpool Cathedral, by Sir Giles Gilbert Scott, and smaller churches by Bodley, Maufe and others are characteristic.

Spasmodic eclectic influences in America are observable in the "Italian" houses of Alexander Jackson Davis and Minard Lefever; and in the work of Arthur Gilman (1821-82), such as the Boston City Hall and the old Equitable Building in New York, French influences appeared. Yet the liberation from the architectural bathos of the post-Civil War period came only through men who had received their architectural training in France, such as RICHARD HUNT (1828-95), C. F. McKIM (1842-1909) and LOUIS SULLIVAN (1856-1924). Moreover, in architectural schools which were being started (Robert Ware was the pioneer, at the Massachusetts Institute of Technology, and Columbia University followed soon after), French ideals of design and planning were stressed. Nor was the old classic revivalism yet entirely dead; Walter's additions to the United States Capitol were completed only in 1865. An eclectic classic style was therefore inevitable. The great world's fairs and expositions of Chicago, 1893; Buffalo, 1900; St. Louis, 1905, and San Diego and San Francisco, 1915, merely followed educated taste and popularized it; they did not create it. American eclecticism, about 1890-1915, falls into four classifications: 1. Buildings based on the combination of classic forms both from Greece and Rome and from the Italian Renaissance, as in the work of McKim, Mead and White, exemplified by Columbia University Library, New York; Villard houses, New York; Morgan Library, New York; Minneapolis Institute of Art; Court of the Universe, San Francisco Exposition; Pennsylvania Station, New York. 2. Buildings based on the French idea that plan and function must be expressed in exteriors, and often with French Renaissance detail, as in the New York Public Library and the Portland, Maine, City Hall by Carrère and Hastings, and the Festival Hall at the St. Louis Exposition by Cass Gilbert. 3. An attempt to adapt classic motives to modern commercial buildings. Despite occasional near-successes, like the New York Municipal Building, by McKim, Mead and White; the Metropolitan Tower in New York, by E. N. LeBrun; the Lord & Taylor store in New York, by Starrett & Van Vleck, and the General Motors Building in Detroit, by Albert Kahn, the classic styles have proven too intractable for such uses. 4. A synthesis of Georgian and Colonial elements, freely treated, that has produced many delightful town halls, churches and houses and is still a living force.

**Twentieth Century Architecture.** Reactions against this architecture plundering occurred in the minor arts as early as the 1880's. A search for novelty and a new knowledge of Chinese and Japanese art both exerted great influence. This is to be seen in the work of Tiffany in America and the followers of WILLIAM MORRIS in England. The trend from

classicism and medievalism thus inaugurated reached its highest development in Paris in the 1890's and the early 1900's. Under the direction of the French decorator Bing and the Belgian Van der Velde, this so-called Art Nouveau sought freedom in curved line, particularly its characteristic "whip lash," and in a queer mixture of naturalism and conventionalization. Its main aim was to be different and new, expressive of a "new" world. Without sound foundations, its architectural expressions were too often merely eccentric and complex; its most valuable function was in liberating public taste from its past shackles.

Much more architecturally important was the discovery and enunciation of the theory now called functionalism, that is, the idea that every architectural form should flow naturally from its function. Now, the theory runs, every architectural function, structural, economic and sociological, has been so changed by new materials and the industrial evolution, that past forms are no longer adequate for modern buildings. This idea arose in three different centers simultaneously: in Holland, due to the architect Berlage (1856- ); in Chicago, through the influence of Louis Sullivan (1856-1924); and in Vienna, through the work, teaching and writing of Otto Wagner (1841-1918). The Viennese center was the most important because of its rapid development of a group of ardent disciples working through the Wiener Secession and the Wiener Werkstaetter. The architects Alfred Messel (1853-1909) and J. M. Olbrich (1867-1908) popularized the Wagner ideals in Germany in much brilliant work, for example, Wertheim Department Store, Berlin, 1904, by Messel; and Secession Building in Vienna, 1899, and the Darmstadt Exposition buildings, 1901-08, by Olbrich. Wagner's own buildings, such as the Steinhof Church, 1906, tend towards a more conventional expression; but the revolutionary character of his teaching spread rapidly.

The search for a new type of specifically modern architecture was given a tremendous impetus by the World War. Since its close, modern architecture has followed an identical course throughout the western world. Classic and Gothic eclecticism is fast dying, and even an eclecticism based on a thoughtless use of "modernist" forms is being seriously questioned; the search is everywhere for actual personal creation. In general, advanced architects of to-day can be divided into two classes: the doctrinaire designers, extreme radicals, who tend to consider architecture principally from its sociological, engineering and economic aspects; and those who seek a new beauty through a less rigid use of the creative faculty.

**Doctrinaire Architecture.** The chief designer and most able propagandist of this school is LE CORBUSIER (pseudonym for P. Jeanneret, 1887- ). Like most architects of this school, he is much under the influence of the abstract painters of the Dada, Cubist and Sur-Réaliste movements. To the doctrinaire architect, all buildings are primarily machines for a purpose; and, just as machines are beautiful although resulting from the mere careful application of scien-

tific principles and the materials used, so, he thinks, buildings may be made beautiful by a similar scientific approach and a similar cutting out of the non-essentials. Ornament is therefore not only neglected but abhorred by these architects, whose buildings tend to become simple cubical masses, with metal-framed windows in bands, undisguised metal columns, and balconies or terraces with pipe railings. Flat roofs are universal. Esthetic effect is sought only through the harmonious relationship of rectangular shapes, and plans are as unconventional as the exteriors. This plan study, especially in connection with small house and tenement design, and intensive experimentation in the use of modern mechanical techniques and materials are their most valuable achievements. Walter Gropius (1883- ) is the outstanding German example of this school and in his Bauhaus, a building school, in Dessau, follows the logical conclusions of this idealism even further than Le Corbusier, for in the school teaching the hatred of ornament is coupled at times with an actual fear of any obvious beauty. The architecture of Soviet Russia naturally follows similar theories. In America the most important exponents of the school are Howe and Lescaze in the East and Richard Neutra in the West.

**Other Modernist Schools.** The remainder of the modern work of Germany is either under the influence of PETER BEHRENS or of Erich Mendelsohn (1887- ). Behrens, starting out as a painter, has followed the theories of Otto Wagner; he is afraid neither of forms absolutely fresh nor of hints of traditional influence provided they are appropriate. As one of the pioneers of modern factory architecture, his work, such as the Turbine Factory of the A.E.G. (German General Electric Co.) in Berlin, is dignified, monumental, often gracious, and seldom forced. Mendelsohn has always sought for forms that most forcefully and beautifully express a building's purpose; yet the results are always free and seem the result of a felt creation rather than a dogma. The Einstein Observatory tower is characteristic, and his influence dominates the best domestic work of Germany. Modern work in Hamburg is largely based on a free and ingenious use of brick, and tends to a more lavish use of ornament than elsewhere. In addition, Germany is producing a new school of modern church design based upon the free use of concrete, steel, stucco and glass, and making use of lavish and highly stylized color decoration. In Holland the housing designed by J. J. Oud (1894- ) reveals a creative freedom somewhat similar to that of Mendelsohn.

Modern trends in French architecture are confused. Some of the most interesting uses of concrete are to be found there, as in the churches of the Perret Brothers and in the Orly Dirigible Hangar and the bridges of the engineer Freyssinet. Much recent domestic work seems a compromise between the dogmatism of Le Corbusier and the free creation of Mendelsohn and Oud; that of Lurçat and of Mallet-Stephens is characteristic. Some of the churches of Droz and Marrast are noteworthy. Elsewhere, French archi-

itecture to-day tends towards a dry academic type of pseudo-modernist-classic, often overlavish; but French skill in minor works, like shop fronts, is still evident in its chic combination of metal, marble and glass.

Much recent English architecture reveals a great amount of modernist eclecticism, with influences from both France and Germany. The best is probably that which most frankly blends the living elements of past tradition with the new impulses, like the churches of Maufe, the houses of Thomas Tate, or the office building for the London Underground by Adams, Holden & Pearson, in which American influence is marked.

Scandinavian work is generally fresh, lavish and true to tradition. It is not afraid of ornament nor of past forms creatively recast, and there is little evidence of the revolutionary ideas of Gropius and Le Corbusier. At the same time, it seems magnificently alive, continually young, and full of a pagan exuberance and beauty worship. The Stockholm Town Hall, by Östberg, is typical. Norwegian examples tend to a greater heaviness of detail, and Danish work shows stronger German influence. Finnish architecture is largely under Swedish influence, but the work of Eliel Saarinen, as Helsingfors Railroad Station, and Cranbrook School, Birmingham, Mich., has a romantic verve of its own.

In the United States, the high quality of the best eclectic architecture has made eclecticism more tenacious of existence than anywhere else. Moreover, in many places local conditions and materials which change little from year to year have established local types of design still valid. This accounts for the continuing popularity of the so-called Spanish houses of the Southwest and the Colonial work in the East. Yet the necessity for creating new types has been even stronger in America than abroad, due to the combination of elevators, steel construction, high speculative land values, and congested cities, which together produced the skyscraper. *See OFFICE BUILDINGS.*

In addition, the influence of Louis Sullivan and its continuing strength in Chicago have helped undermine the old classic dominance. Sullivan's Golden Door of the Transportation Building of the World's Fair in Chicago, 1893, was too important to go unnoticed, and ever since there has been a continual search on the part of many architects towards a fresh creation of forms, alike modern and beautiful. The most important exponent of the Sullivan tradition is FRANK L. WRIGHT (1869- ). He is always the creator and never the doctrinaire, and his houses show his remarkable ability in using all sorts of materials naturally. Often there is great richness and a utilization of freely created ornamental forms. Romantic and humanistic in his approach, he abhors the theory that a building is a machine, for he believes that a building should be equally as much a poem. Characteristic works are the Larkin Factory, Buffalo; the Coonley house, Riverside, Ill.; his own house, Taliesin, Wisconsin; the Imperial Hotel, in Tokyo, Japan; and various houses in Los Angeles, built since the end of the World War and characterized by the

interesting use of concrete blocks, frequently with cast ornamentation. The Court of the Ages, at the San Francisco Exposition, by Louis C. Mullgardt, was similarly free.

In modern American public buildings the tendency is towards a new monumental classicism recognizably classic but with little or no archaeological detail, like the New York State Office Building in New York City, by the State Architect's Office. In commercial buildings, there is a growing use of a restrained and dignified style, also largely classical in approach, though entirely without historical reference. The Alabama Light and Power Building, Birmingham, by Warren, Knight and Davis, and much of the work of Holabird and Roche, such as the Palmolive Building, Chicago, and the Chicago News Building, fall into this class. The functionalist architects struggle between accent of the vertical lines, like the Empire State Building, New York, by Shreve, Lamb and Harmon, and accent of the horizontal lines, like the McGraw-Hill Building, New York, by Raymond Hood. Perhaps in this struggle there is an implied criticism of the theory.

In general, there is little doctrinaire work done in America to-day. Instead, whatever the basic style, whether classic or romantic, the best shows much of the free verve and delight that characterize Scandinavian work. The telephone buildings of Voorhees, Gmelin and Walker are typical. This fresh approach is true even in work of a distinctly sociological character, such as housing. The Grand Street Apartments, New York, by Springsteen and Goldhammer, are an excellent illustration. T. F. H.

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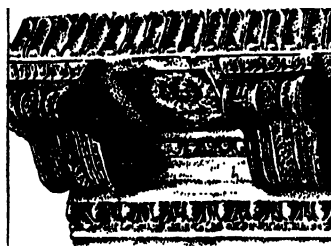
**MODERN BRITISH DRAMA.** See ENGLISH DRAMA, MODERN.

**MODERN WOODMEN OF AMERICA**, a fraternal and beneficiary secret society founded in 1883 "to bind in one association the Jew and the Gentile, the Catholic and the Protestant, the agnostic and the atheist." Membership is confined to whites, who must be American citizens. Modern Woodmen of America admits women and maintains a special department for children under 16. It is in operation in 46 states and four Canadian provinces, and had a membership of 713,064 in 1932. Headquarters are at Rock Island, Ill.

**MODESTO**, a city in central California, county seat of Stanislaus Co., situated on the Tuolumne River, 80 mi. southeast of San Francisco; it is served by three railroads and by bus and truck lines. There is an airport. Modesto is in the northern part of the

San Joaquin Valley, an extensively irrigated region which produces alfalfa, grapes, apricots, peaches, melons, figs, peas, beans and tomatoes. The chief manufactures are canned fruits and vegetables, butter—from a cooperative creamery—and cheese. The retail trade in 1929 amounted to \$19,005,507. The Don Pedro and the La Grange dams on the Tuolumne River supply water for industrial power, irrigation and reserve purposes. Modesto, founded in 1870, was incorporated in 1884. Pop. 1920, 9,241; 1930, 13,842.

**MODILLION**, in classic architecture, a bracket-like form which supports the overhanging corona of a classic cornice. Modillions are usually decorated with S-scrolls, often with acanthus leaves on the underside. They are equally spaced and project from the top band, which is sometimes called the modillion



COURTESY P. P. CAPRONI & BROS.

A CORINTHIAN MODILLION

band, of the cornice BEDMOLD. The modillion was a Roman invention, used in connection with the Corinthian and Composite orders. In a few Roman and many late Renaissance examples uncarved or block modillions were used. The Baroque architects often spaced modillions unequally, and used great freedom in their individual design. See ORDER.

**MODJESKA, HELENA** (1840-1909), Polish-American actress whose real name was Helena Modrzejewski, was born at Cracow, Poland, Oct. 12, 1840. She was leading woman in Cracow, in 1865, and a star in the Imperial Theatre, Warsaw, 1868. Eight years later she came to live in California with her second husband Count Chlapowski, and after only a few months' study of English, returned to the stage in *Adrienne Lecouvreur*, in San Francisco, 1877, with great success. Mme. Modjeska then made her debut in London as Camille, 1880. She starred with EDWIN BOOTH in 1889-90, and toured alone in America and abroad until 1905. She died at Bay City, Calif., Apr. 8, 1909, and was buried in Cracow.

**MODJESKI, RALPH** (1861- ), American civil engineer, was born in Cracow, Poland, Jan. 27, 1861, a son of the actress, Helena Modjeska, who brought him to the United States in 1876. He studied engineering at the Collège des Ponts et Chaussées, Paris, and in 1892 established himself in Chicago, Ill., as a consulting engineer in bridge construction. He had charge of the erection of the bridge across the Mississippi River at Thebes, Ill., of the Government bridge at Rock Island, Ill., and of bridge construction for the

Northern Pacific Railway. In addition he designed and built the Columbia and Willamette River bridges for the Portland & Seattle Railroad, and was chief engineer for the McKinley Bridge at St. Louis, Mo., the Columbia River Bridge, Celilo, Ore., and the Delaware River Bridge at Philadelphia, Pa.

**MÖDLING**, an old Austrian city, situated near Vienna at the usual entrance to the Bruhl Valley, a favorite excursion point of the Viennese. Various points of vantage on the nearby wooded hills afford attractive views. In Mödling are a Gothic church and a Romanesque chapel of the 12th century, the latter having been entirely modernized. There are several manufacturing plants and a number of educational institutions and sanatoriums. Pop. 1923, 18,677.

**MODOC**, a North American Indian tribe speaking a dialect of the Klamath or Lutuamian stock and comprising its southern division in southwestern Oregon. They lived formerly on Little Klamath, Modoc, Tule and Clear Lake in the valley of Lost River. They were constantly in a state of hostility toward the whites and after being segregated on the Klamath Reservation attempted to return to their original habitat, causing the Modoc war of 1872-1873, after which the tribe was divided, part being placed on the Quapaw Reservation in Indian Territory and part on the Klamath Reservation. Culturally the Modoc appeared to have belonged with the north central Californians, though in many traits their relationships were with the Columbia River peoples, as in those of the sweathouse, the semiunderground house, in costume and head deformation.

**MODULATION**, in music, the passage from one key to another in the sense that a new tonality is thoroughly established. It should be distinguished from a mere transition into another key which is suggested temporarily and then quitted. For example, the following is not a modulation:



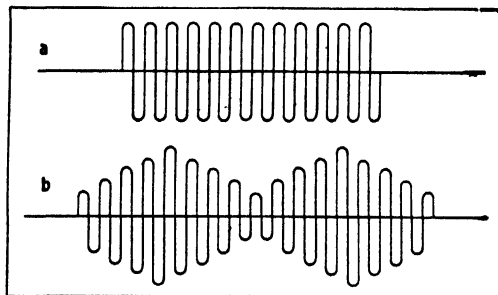
On the other hand, a true modulation, the thorough establishment of a new tonality, is the following:



Modulation may be effected in so many ways, and depends upon such a variety of circumstances, that set rules are of negligible value. The one invariable criterion of a true modulation is the auditor's willing-

ness to accept a new keynote for the old one; that is, to feel as completely at home in a new key as he did in the key which was abandoned.

**MODULATION**, in radio, the variation in the amplitude of the carrier current in a transmitter. Feeble currents from a MICROPHONE are amplified until sufficient power is available for regulating the amount of high-frequency current in the transmitter. This may be done in an early stage if a MASTER OSCILLATOR is used. The amount of acoustic power required is small in this case. High-level modulation may be accomplished by using sufficient power at AUDIO FREQUENCIES to control the magnitude of the high-frequency current in the stage which feeds the ANTENNA.



GRAPHICAL DIAGRAMS OF ALTERNATING CURRENT

(a) A constant amplitude high frequency current; (b) the same current modulated about 50% by pure tone

In the accompanying figure, *a* is a graphical representation of a high-frequency current of constant amplitude; *b* shows the same current modulated about 50% by a pure tone. See also RADIO COMMUNICATION.

**MODUS VIVENDI**, a common method of preliminary diplomatic settlement, and a temporary expedient resorted to by the executive in case of emergency, pending action by the ratifying authority, such as the Senate of the United States. A *modus vivendi* providing for the protection of fur seals in the Behring Sea within certain areas was agreed upon between the United States and Great Britain. In 1905 the domestic situation in Santo Domingo was critical. The country was threatened by the intervention of foreign powers because the Dominican government had not met its foreign debt. President THEODORE ROOSEVELT, by means of a *modus vivendi*, agreed with Santo Domingo that the United States should take over the administration of the customs revenues of the country and apply the receipts to discharge her internal and external obligations. In 1907 the *modus vivendi* was displaced by a treaty ratified by the Senate of the United States. C. E. MA.

**MOE, JORGEN INGEBREKTSEN** (1813-82), Norwegian poet and collector of folklore, was born at Moc, in Ringerike, Apr. 22, 1813. He was a clergyman and became Bishop of Christiansand. His name is always associated with that of P. C. ASBJORNSEN, with whom he collaborated in the famous *Norwegian Fairy Tales*. Moe's first literary work was a *Collection of Songs, Ballads and Staves in the Norwegian*

*Popular Dialects*, also the author of several volumes of poetry. He died at Christiansand, Mar. 27, 1882.

**MOERAE**, in Greek mythology, the three goddesses of fate, the same as the Roman Parcae or FATES.

**MOGADISCIO**, also Mukadishu, capital of ITALIAN SOMALILAND in east Africa. It is situated on the coast in the southern part of the colony and is connected by railway with Villagio Duca degli Abruzzi, 70 mi. distant. The city, besides being the administrative center of the territory, is an active trading place for sesame oil, gum, resin, ivory, and cotton and cotton seed oil. The imports include sugar, timber, tea, coffee and machinery. Pop. 1927, 28,000; Europeans, 800.

**MOGADOR**, Africa, a port on the Atlantic coast of Morocco in the French protectorate. It is situated on a craggy headland stretching into the Atlantic and encompassed by sand dunes on the land side. Hides, wool, gum arabic, olive oil and almonds are exported. Because of its even-tempered climate, sufferers from lung diseases in increasing numbers are making use of Mogador as a health resort. Pop. 1926, 18,401.

**MOGILEV**, an important city in the central part of the White Russian S.S.R., situated on both banks of the Dnieper River. It is an industrial city whose chief products are leather and bristles. A number of smaller factories produce flour and tobacco products. Flint stone from the environs is shipped throughout the Soviet Union. There is also river trade in agricultural products and fish. Founded in the 13th century, invaded and plundered by Poles, Cossacks and Swedes, Mogilev became Russian territory in the 18th century. Important buildings are the cathedral, the Bogoyavlensky Church, an ancient synagogue and the museum. White Russians compose the bulk of the population, with Jews composing a substantial minority. Pop. 1926, 50,104.

**MOHAIR**, a term applied to fabrics made from the hair of Angora goats of Asiatic Turkey. The hair used is up to eight ins. long and from 1/600 to 1/800 in. in diameter, white in color, soft, elastic and very strong. The best grade in Constantinople, Turkey, is spoken of as "Mukhayah" (first-class) whence the name mohair. It was largely used by Turks for making kaftans; the raw wool was first sent in quantity to Bradford, Eng., in 1848, and has since been used in the manufacture of plushes, moquettes, dress fabrics, and trimmings. Angora goats have been exported to South Africa, United States, Australia and New Zealand. In Australia and New Zealand they do well, feeding on scrub and blackberry. Angora goats are poor milkers, and if the fleece is not shorn in spring, it falls off in summer. The wool has the advantage of not shrinking in milling, hence its use for astrakhans; it is also used with other fibers for linings, upholstery fabrics, velours and artificial furs of great beauty. It is easily dyed, similarly to sheep's wool, and is very durable. F. G. P.

**MOHAMMED or MAHOMET** (c. 571-632), the founder of the religion of Islam, or Mohammedanism,

was born of humble parents, Abdallah and Amina, in the town of Mecca, about 571 A.D. The name Mohammed (Muhammad, "one highly praised") is that of his eminence; it is uncertain by what name he was called as a boy, although in later years he was known as Abu'l Kasim, "father of Kasim."

Various influences played upon Mohammed in his earlier years. Legend has it that he was nursed as a babe at the breast of a desert woman. His people held sacred such objects as trees, hills and heavenly bodies, and especially the black stone in the Kaaba in the holy city of MECCA. They offered animal, and sometimes human, sacrifices on their altars to this deity and that. They employed magicians and diviners in various affairs of life. But in spite of all the evidence to the contrary, the Arabs, especially those of the several towns, were an irreligious, reckless, skeptical and materialistic people. In addition to the general pagan environment of the times, Mohammed knew certain Jews, Christians, and Sabians, felt their influence, respected them as "people having books," and listened often to their discussions of religious themes. From Jews, and Christians in particular—such as he knew in his remote home—he gathered scattered bits of Biblical narrative which he stored in his retentive memory. For a period of his life, when he first began his earnest quest, and to some extent afterwards, he looked toward both Jews and Christians for aid, but he came in time to renounce their ways, even as he rejected his native paganism.

The turning-point in Mohammed's career came when he was 40, or about 610 A.D. He had married 15 years previously a well-to-do widow of Mecca, Khadija by name. This marriage had been for him an altogether fortunate venture, for it gave him social standing and a competency—and, in the end, opportunity and leisure for religious meditation. He took to visiting, for the sake of quiet contemplation, a cave in Mt. Hira, beyond the edge of the town. He doubtless pondered there many things, including the social abuses of the day, experiences gleaned on his journeys abroad, associations with Christian monks, the words of Scripture—and the fact that no prophet had ever arisen from among his own people, the Arabs. Once while in prayer in the cave, he passed through a conversion, and after this had later been confirmed, following an interval of suspense, he held himself to be the chosen messenger of God to his countrymen.

In receipt of "revelations" from time to time, he prosecuted his mission as prophet. The record of his "call" may be read in suras (chapters) 96 and 72 of the Koran. From being merely a seeker, *hanif*, he came to be a Moslem, *muslim*, "one who has submitted" in the service of One whom he first knew as Lord, *rabb*, or The Merciful, *rahim*, *rahman*, and finally as Allah, "The God." The word of Allah came to Mohammed, so he said, through the angel Gabriel. This assertion the prophet made in order to counteract the charge made by his enemies that he was be-jinned (*ma junun*, "possessed of a spirit"). It is not

certain how long he prosecuted his mission secretly in his native city—many years, at least. His first convert was Khadija, his next, an adopted son. Among those who early accepted the new faith of Allah were Abu Bekr, Othman, Omar, and Hamzah. Soon the Koreish became indistinctly aware of the movement which would inevitably, if successful, wipe out their vested interests in the Kaaba as the center of pagan pilgrimage and worship. When signs became clearer, the pagan Meccans adopted the heavy weapon of persecution. Some of the humbler converts took refuge for a time in the Christian state of Abyssinia. Mohammed and his more influential followers made a temporary agreement to desist from propaganda. An attempt was made to take refuge in the desert town of Tayif. All this was but a temporary pause.

In July, 622, Mohammed and his companion Moslems emigrated from Mecca to friendly Yathrib, since called al-Medina, "the city" of the Prophet. This is the Hegira (*hijra*, "flight"), marking the year one in the Moslem calendar. In Medina Mohammed found a ready soil and support for his new venture in religion and morals. There he laid the concrete foundations of Islam in further development of his prophetic mission. In Mecca he had at last preached openly in the name of Allah against polytheism, the oppression of the poor, covetousness, dishonesty in trade, and the "insolent unconcern for the higher interests of life." In Medina he completed the body of his teachings, including the prohibition of drink, indicating the main articles of belief, and instituting the ritual practices. For example, he made imperative belief in Allah without any second deity, respect for angels and certain of the prophets, and such acts as prayer, almsgiving, fasting, and pilgrimage.

Mohammed did not succeed in Medina without opposition. He had to overcome both Arab hypocrites and hostile Jews. He was forced into warfare with the Meccans who took the aggressive against him. In 624 at Badr, between Mecca and Medina, he won a signal and encouraging victory, which has since been called the Day of Deliverance. At Uhud, however, in 627, near Medina, he suffered a severe defeat and was left on the field for dead. Later the Meccans laid vigorous but futile siege to Medina itself. But, in the end, both by his diplomacy and an increase in the strength of his cause, Mohammed secured the peaceful submission of Mecca and the conversion of all its citizens. During the last year of his life he led the annual pilgrimage to the Kaaba. Mecca, purged of its paganism, has since been the center towards which the Moslems turn in prayer, the goal of the believer's pilgrimage, and the religious capital of the Moslem world.

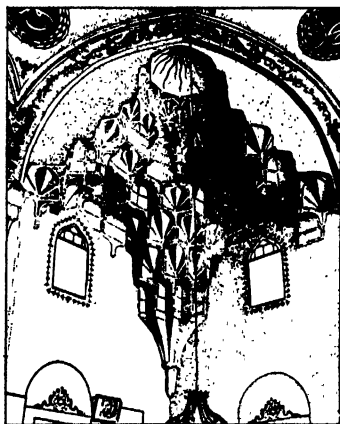
After the death of Khadija in 619, the prophet married other wives—at least eleven in all, including a Jewess. He had two sons and four daughters by Khadija, and one son, Ibrahim, by a Coptic slave girl, Mary. Ibrahim died in infancy, Khadija's daughter Fatima married Ali, and their descendants figured conspicuously in the Shi'a heresy which ultimately

split Islam asunder. Lacking a direct heir, Mohammed's work was carried on by elected officials known as caliphs or successors. The prophet died in June, 632, in Medina, and was buried beside the mosque (*masjid*, "place of worship"). Several years afterward his miscellaneous revelations and teachings were arranged in arbitrary order in the KORAN, and later still, many other sayings of his were assembled as *Hadith*, "tradition." These two works are today the tangible evidence of Mohammed's prevailing influence in the House of the Faithful, which now comprises 235,000,000 believers.

J. C. A.

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**MOHAMMEDAN ARCHITECTURE**, the architecture developed by those peoples professing the Mohammedan religion. The rapid spread of the Moslem conquests, so soon after the creation of Mohammed-



TURKISH STALACTITE WORK  
Mosque of Dawud Pasha, Constantinople

anism, prevented the slow growth of any completely organized art type; yet the Mohammedans, like the Romans before them, conferred their own trademark upon everything that they did, however eclectic their architecture was in its wholesale borrowings from other styles. The chief influence behind early Mohammedan design was evidently Iranian, and the skill in vault building, as well as many tricks of detail first developed by the Sassanian Persians, became characteristic of Mohammedan work almost everywhere. The mosque idea itself gave a certain unification over the whole Moslem world; its essential elements (*see* MOSQUE): enclosed portion, arcaded court, mihrab, mimbar and minaret, are well-nigh constant, despite the tremendous differences developed in various parts of the world. These differences can be classified into five different schools: (1) Arabian, early Syrian, and early Egyptian; (2) Moorish and Hispano-Moorish; (3) Persian; (4) Turkish and later Egyptian; (5) Indian.

**Common Features.** Certain features are found in nearly all of the Mohammedan styles. The first is



a love of surface ornament, in which elaborate geometrical interlaces play a large part; even when foliage is used in this decoration it is always highly conventionalized and made subservient to the geometrical pattern. The second is a universal skill in using various types of arch, especially the pointed arch, the horseshoe arch, and the cusped arch, all of which go back to Sassanian sources. The third is the love of color, obtained usually through the use either of ceramic tiles or of marble inlays and mosaics. The fourth is the common use of stalactite ornament, both for important structural elements, like pendentives, and for minor decorative functions in cornices, capitals, etc. These stalactites vary from the soft, intersecting arches of Persia, through the rounded hollows of the niche-like types of Arabia, Egypt and the Moors, to the sharp, crystalline shapes of Turkey.

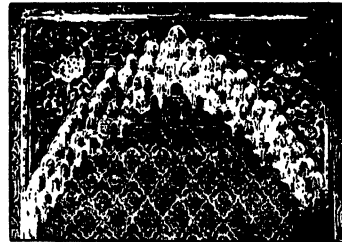
#### **Arabian, Early Syrian, and Early Egyptian.**

The unbelievably swift conquests of the early Mohammedans brought them, by the beginning of the 8th century, into close contact with the early Christian architecture of Syria and the vivid building tradition of the Sassanian Persians. Nomads as they were, with little building tradition of their own, the history of their early architecture consists of their rapid assimilation of the building cultures of the lands they had conquered, and their use in constructing mosque buildings. Many of their older mosques, such, for instance, as the Great Mosque in Damascus, were merely altered or reconstructed Christian churches; yet in every case the older buildings were entirely transformed in plan. The essential of the mosque scheme was originally a large, covered area, in which the faithful, ranged in long lines, could pray. This naturally developed a building, with its long side open towards the court, with a roof supported by many columns, and the long wall opposite the entrance decorated with one or several prayer niches or Mihrabs. Thus, when the Damascus church was changed to a mosque, one side aisle wall was removed and replaced with arcades, so that what had originally been the side became the entrance front of the building. In Jerusalem the Mosque of El Aksa preserves much of the plan and certainly incorporates many of the details of the Church of St. Mary the Virgin, built by Justinian. In this case, since the orientation could not be reversed, the mosque was widened by the addition of extra aisles at the side. This first alteration took place as early as 691; but the present pointed arches date from a reconstruction by Saladin. The polygonal form of the other early mosque in Jerusalem, the Dome of the Rock, may have been suggested by Constantine's Church of the Holy Sepulchre. In any case, the domical type was originally a Christian type, though perhaps developed from Iranian precedents.

With growing building skill, the later mosques became more typically Mohammedan, and the type holds true alike in Egypt, North Africa and Mesopotamia. Thus the ruined Great Mosque at Samarra, 846-52, and the Mosque of Ibn Tulun, in Cairo, 868-

969, both have a rectangular courtyard of great size, surrounded with arcades or colonnades, and a large enclosed portion, whose roof is supported by many rows of piers; in the center of each courtyard there was evidently originally a fountain for ablutions. It is noteworthy that in both mosques Sassanian details are repeated and developed: piers with their corners decorated by applied colonnettes, and the use of the cusped arch for windows and niches. The rich stucco relief ornament of the Mosque of Ibn Tulun, and its use of pointed arches, are also probably Persian in origin. The design of the prayer niche, or Mihrab, on the other hand, seems to be an interpretation of the Christian church apse in the current pointed arch form. The great mosques of the Fatamids in Cairo preserved this original plan, as in the Mosque of Hakim, 990-1013, or that of El Azhar, founded in 970. Meanwhile, the minaret, or tower from which the Muezzin calls to prayer, was developed from the crude type of Ibn Tulun, with its outside stair, and the extraordinary circular example at Samarra, with its ascending spiral, into the characteristic square tower with an open loggia at the top. Wall treatments generally followed Byzantine ideas in their use of marble sheathing, with concentrated richness obtained by low relief stucco work, in which there is much use of decorative inscriptions as borders and geometric overalls as field patterns. Certain tomb mosques, such as that of Al Juyushi, with their domed central chambers and vaulted halls, show the increasing importance of the vault that led to the later mosque forms.

**Moorish and Hispano-Moorish.** The Mosque of Kairouan, begun in the 7th century, shows that the conquering Arabs carried the same tradition into Tunis and Algeria. As the Moorish power in North Africa increased, its distance from the Mohammedan center led to changes in detail, but none in general plan. Roman columns and capitals, and capitals based on Roman forms, were more common; and a local school of tile makers promoted the development of the magnificent Moorish wall tiles, at first set as



STALACTITE WORK IN THE ALHAMBRA,  
GRANADA, SPAIN

mosaics to form geometrical patterns, and later with patterns fired on the individual tiles. The Mosque at Kairouan shows also the importance which the dome, placed over the Maktoub, or central sanctuary, was rapidly achieving, and also the unparalleled richness both of color and relief, for which the

Moors were always striving. This reached its climax in the Great Mosque at Cordova, in Spain, whose interlacing cusped arches in dark and light voussoirs, and complicated vault forms in wood or masonry, are balanced by the elaborate polychromed surface relief of the kind made famous by the Alhambra. The Alhambra, in Granada, largely of the 14th century, shows even to-day the fairylike quality that such richness, glowing with blue, gold and red, can produce. Noteworthy in this later Moorish work are the column capitals of simple geometrical shape, lightly carved, and the lavish use of stalactite forms like little, curved, pendent niches.

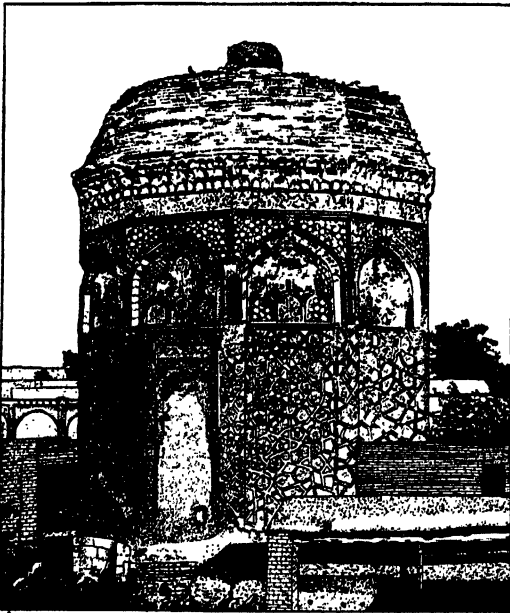
**Persian School.** It is natural to find a tremendous development of monumental vaulted architectural forms in Persia, where the Sassanian architects had already developed vault forms which profoundly affected not only Mohammedan work, but that of medieval Europe as well. The great period of Persian Mohammedan architecture is from the 11th century on. The Djouma Mosque, at Ispahan, begun in

geometrical tile and stucco relief of the Moors, they used more and more exquisite foliated tiles, in blue, green, touches of yellow, and touches of red, which have made Persian tiles famous. These tiles covered not only the interior, but the exterior as well; and the high, onion type, covering domes that are typical of later Persian architecture often glowed with blue and gold. With such decoration, architectural forms in general remained simple. The Great Mosque of Bagdad, the Djouma Mosque of Veramine, and the Blue Mosque of Tabriz, as well as many tombs, show the extraordinary richness of color and simple monumentality of line which the Persian architects achieved.

**Turkish and Later Egyptian.** It is natural that the Byzantine influence and that of the Christian churches of Armenia were strongest in the Mohammedan architecture of the Seljuk and Ottoman Turks. Konieh and Sultan-Khan are full of 13th century monuments which show the most remarkable combination of Persian, Syrian, Arabic, Armenian and Byzantine details, whose proportions vary so greatly that few generalizations are possible. Cut stone plays a more important part than in other Mohammedan styles, and the elaborate use of the interlace is common.

The Ottoman Turks, after their conquest of Asia Minor, and still more after the fall of Constantinople, based their design almost entirely on Byzantine forms, and in doing so completely abandoned the earlier mosque type. The typical Turkish mosque is merely a variant of Byzantine church forms, fronted with an elaborate colonnaded court, and with one or more extremely slender minarets, often ringed with several balconies and crowned by steep, conical, wooden tops. This type, which appears as early as the Green Mosque in Brousa, begun 1414, reached its climax in the tremendous open spaces of such Constantinople mosques as the Sulimanieh, begun 1550, by the great architect Sinan, and the even larger, though less carefully studied, Achmedieh, begun 1608. Both of these take the Byzantine idea of St. Sophia, a simple dome high in the air, supported on four large piers and buttressed by half-domes and corner buttresses, and develop it with a logic and a simplification such as the Byzantines never achieved. The manner in which half-domes and small domes lead inevitably up to the main central dome is superb, and exactly the right contrast is furnished by the slim, pointed minarets.

Turkish detail is by no means so great as the basic conceptions of its architecture. The most beautiful detail is usually that found around the doors, which as in most of the Mohammedan styles are made into climbing motives that occupy the entire height of the wall. In Turkish work, the door proper is crowned by an arch of varicolored voussoirs and set into a niche topped with the richest stalactite work, in which the stalactites have an almost crystalline character. Turkish column capitals made of similar stalactites are also interesting; but particularly in the later periods surface decoration, either in tile or carved



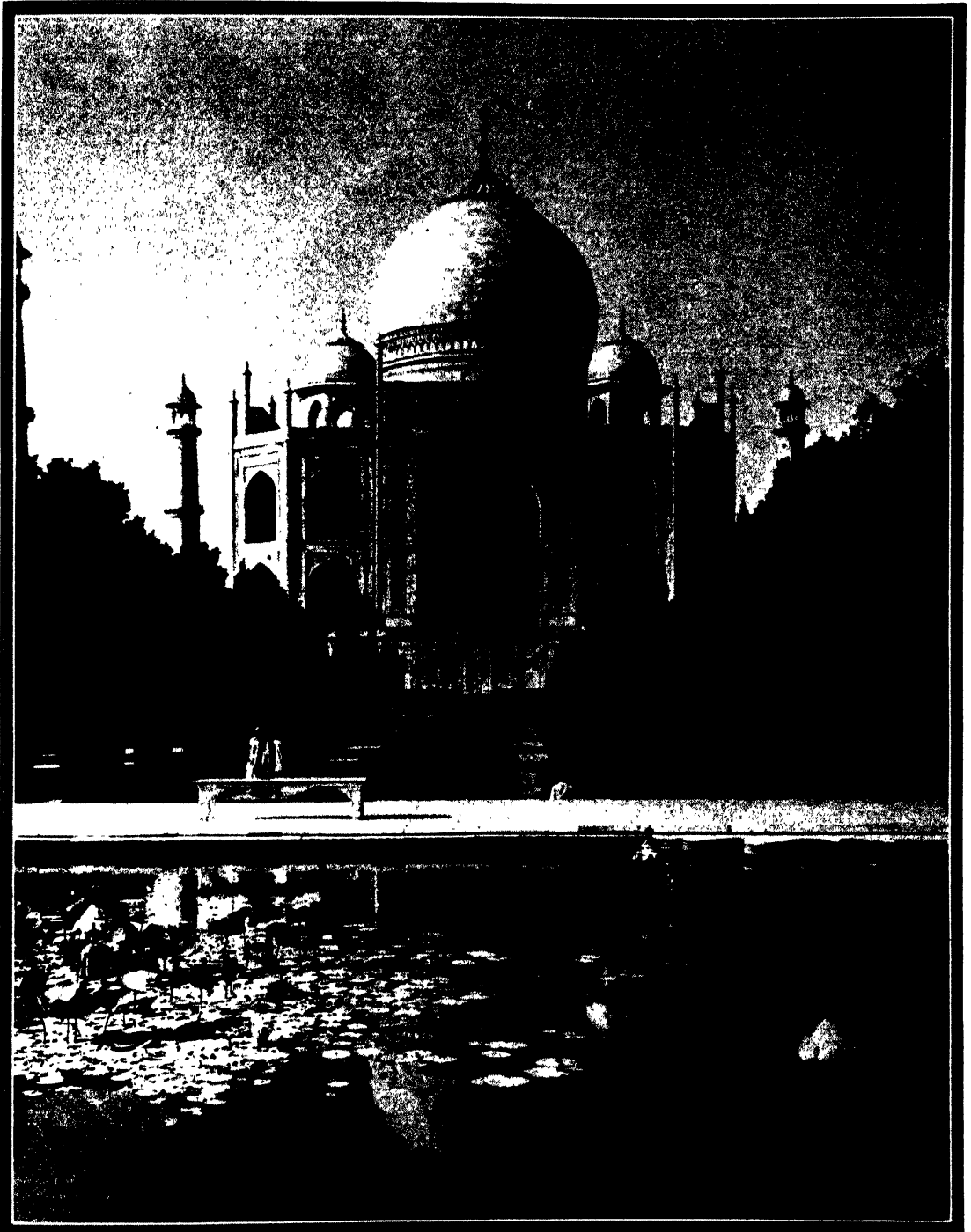
FROM PHOTO BY EWING GALLOWAY, N. Y.

**PERSIAN SHRINE OF THE 13TH CENTURY**

*Erected to Imam Husein, descendant of Mohammed, known as the provider of rain and good crops*

765, much enlarged in the late 11th century, and partially rebuilt and redecorated in the 16th century, shows how the architectural genius of the Persians has made out of the simple mosque scheme a monumental conception of tremendous power. In the middle of each side of the court the arcade is interrupted by colossal arches that are merely the entrance to enormous vaulted halls. These great pointed arches, in rectangular frames, and flanked by slim minarets, are characteristic Persian forms. The Persians, like the Moors, loved surface richness; but, instead of the

## MOHAMMEDAN ARCHITECTURE



EWING GALLOWAY PHOTO

### THE TAJ MAHAL AT AGRA, INDIA, SEEN FROM THE TAJ GARDEN

Built in the 17th century by the Emperor Shah Jahan as a tomb for himself and for his favorite wife, Mumtaz-i-Mahal, the Taj Mahal is considered an example of Mohammedan architecture at its highest point. Ustad Isa was the architect.

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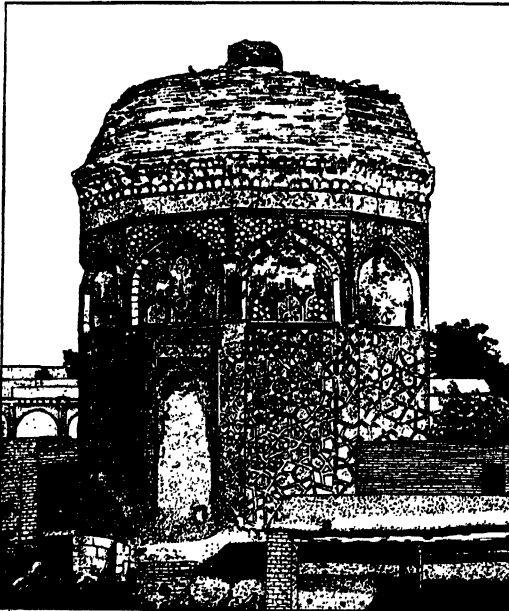
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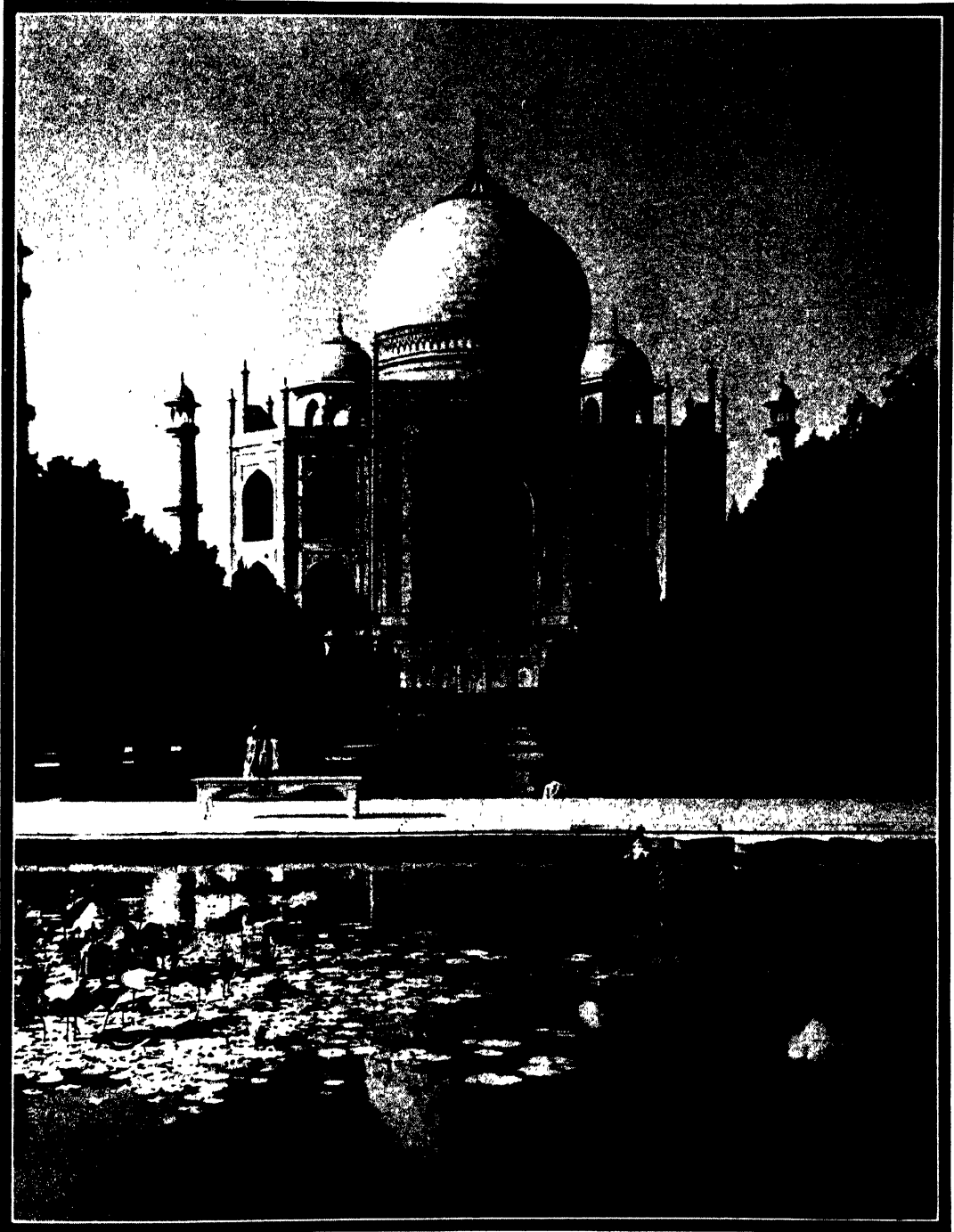
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## MOHAMMEDAN ARCHITECTURE

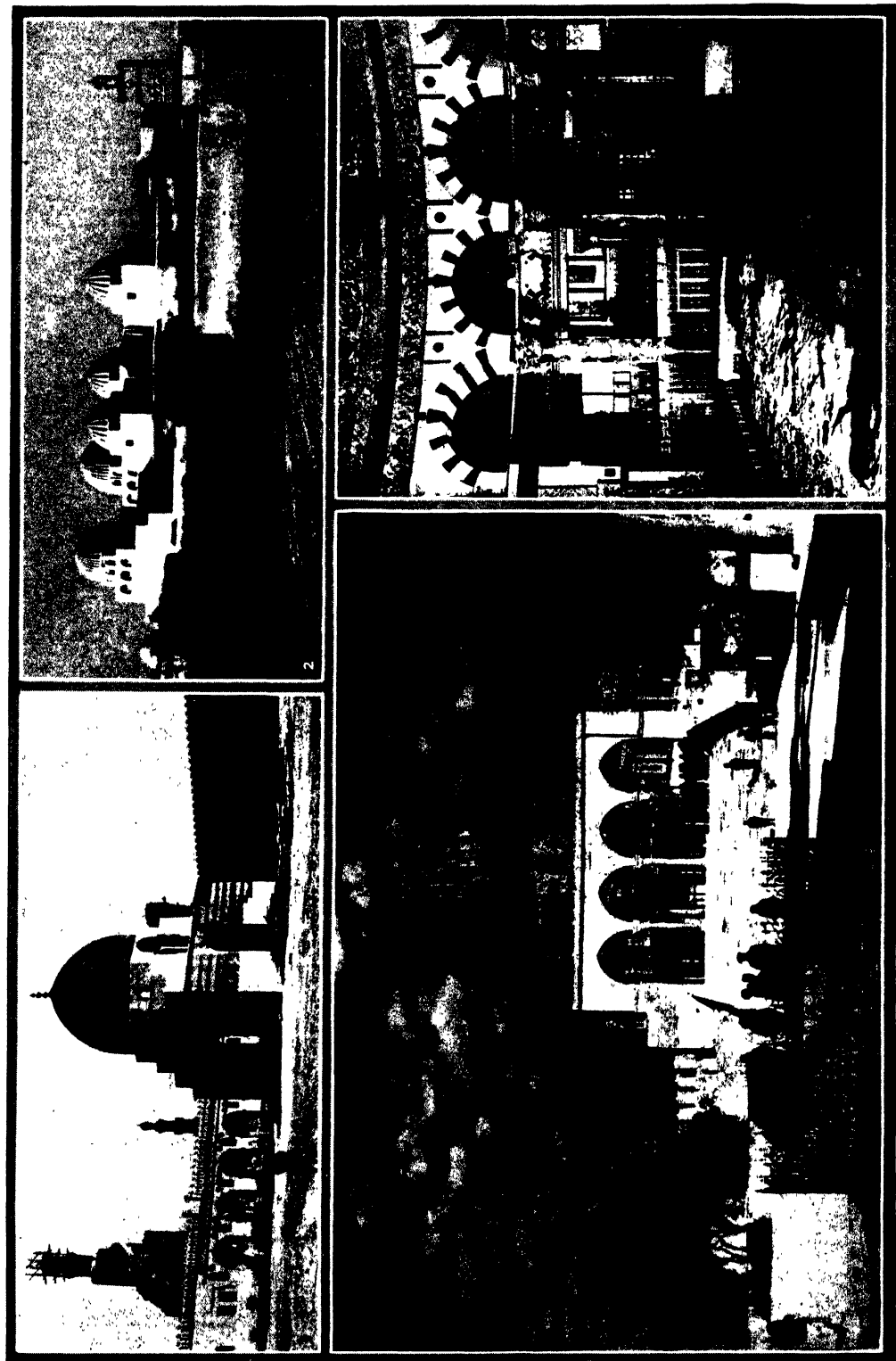


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# MOHAMMEDAN ARCHITECTURE

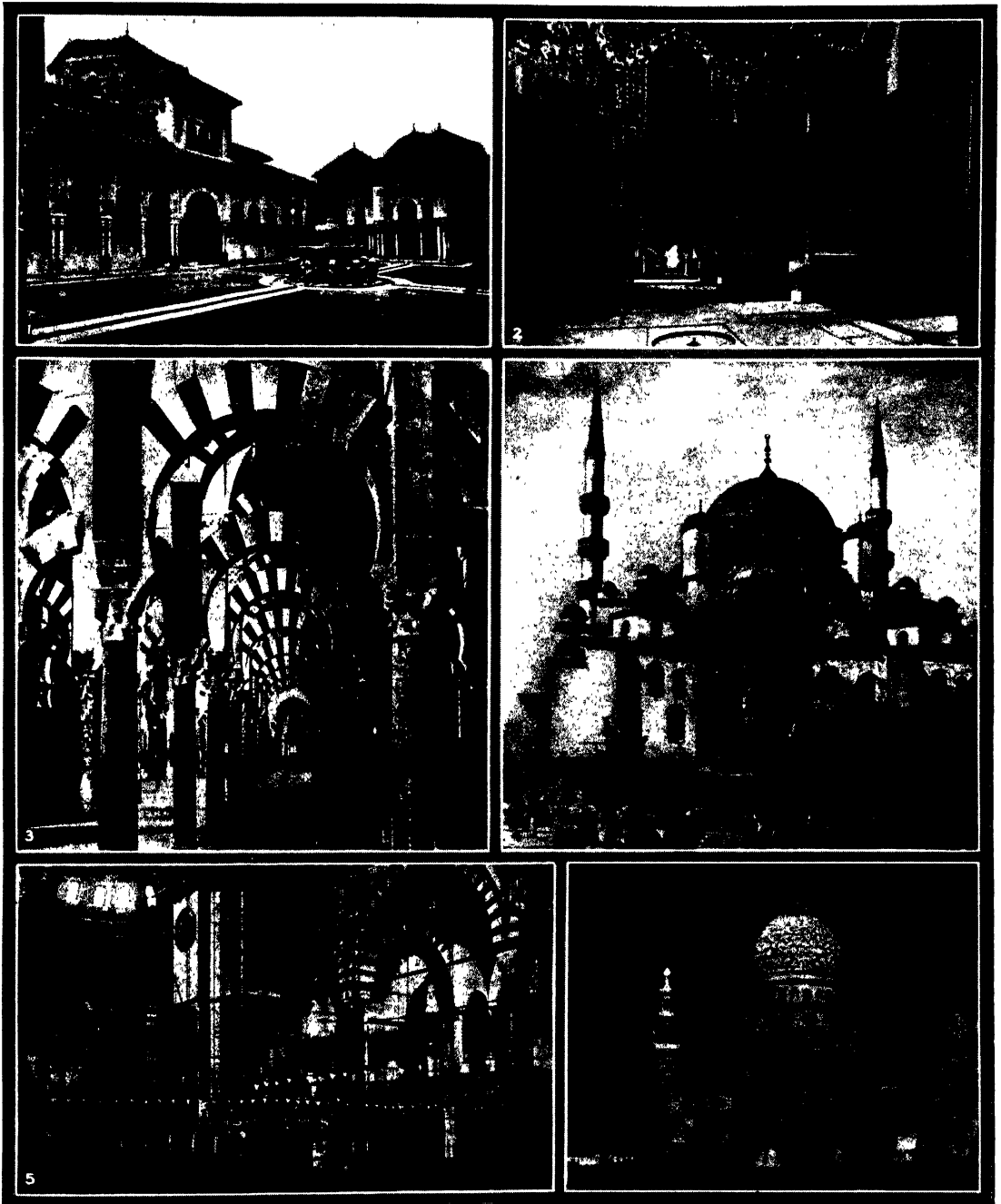


1. 4. EWING GALLOWAY PHOTO; 2. COURTESY (AMERICAN LINE)

## MOHAMMEDAN ARCHITECTURE IN NORTHERN AFRICA AND PALESTINE

1. Mosque of Ahmed Ibn Tulun, Cairo, Egypt. 9th century A.D. 2. Mosque of the Swords, Kurwan, Tunisia. 3. Dome of the Rock, or Kubbet es-Sakhra (the Mosque of 'Omar), Jerusalem. 7th century A.D. 4. The holy rock in Kubbet es-Sakhra, where, according to tradition, Abraham and Melchizedek sacrificed.

## MOHAMMEDAN ARCHITECTURE



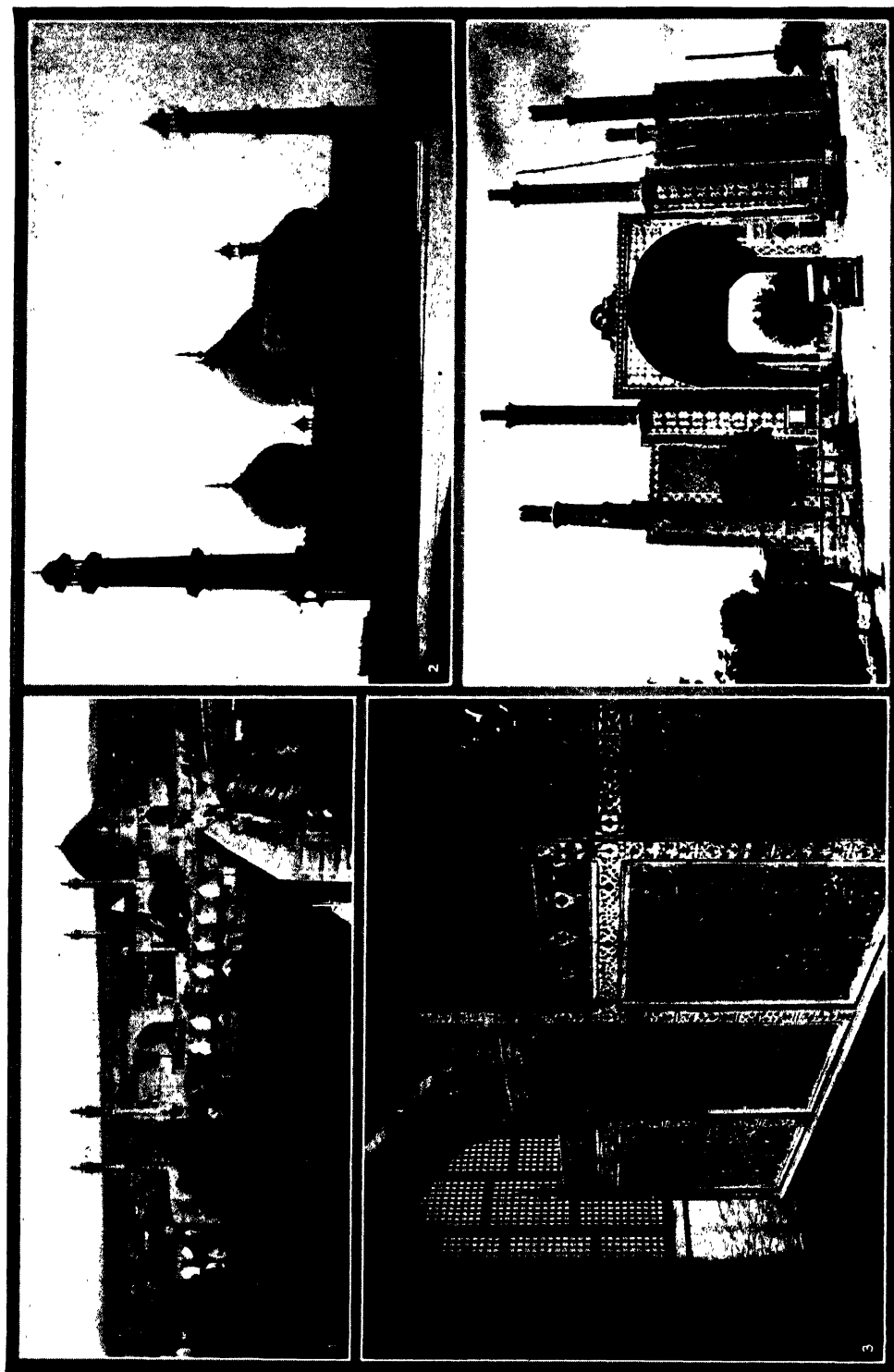
6. PHOTO BY GARDNER WELLS. FROM R. I. NESMITH AND ASSOCIATES

### MOHAMMEDAN ARCHITECTURE IN SPAIN, TURKEY AND EGYPT

1. Courtyard of the Lions with the façade of the Room of the Two Sisters, the Alhambra, Granada. 14th century. 2. The Room of the Two Sisters in the Alhambra, with a partial view of the intricate stalactite pendants and cell-formation of the ceiling. 3. Interior of the Cathedral of Cordova, Spain, the "Chief Mosque" of the Moors, founded

about the 8th century. 4. Mosque of the Sultan Yeni-Validé, Constantinople, built in 1615-65. 5. Interior of the Mosque of Sultan Sulciman the Great, Constantinople. 16th century. Sinan, Architect. 6. View of the white-domed Tombs of the Caliphs, Cairo, Arab mausolea of the Egyptian rulers. 14th-16th centuries.

# MOHAMMEDAN ARCHITECTURE



1. OCCIDENT AND ORIENT PHOTO; 2, 3, 4. ERING GALLOWAY PHOTOS

## MOHAMMEDAN ARCHITECTURE IN INDIA AND PERSIA

1. The royal mosque, Masjid i-Shah, Isfahan, Persia, built of blue tile.
2. Jami Masjid, the great mosque of Delhi, showing its three white marble domes.
3. Trellised marble screen in the Taj Mahal covering tombs of Shah Jahan and his wife.
4. One of the seven ornate arched entrances to Tcheran, capital of Persia.



## MOHAMMEDAN ART



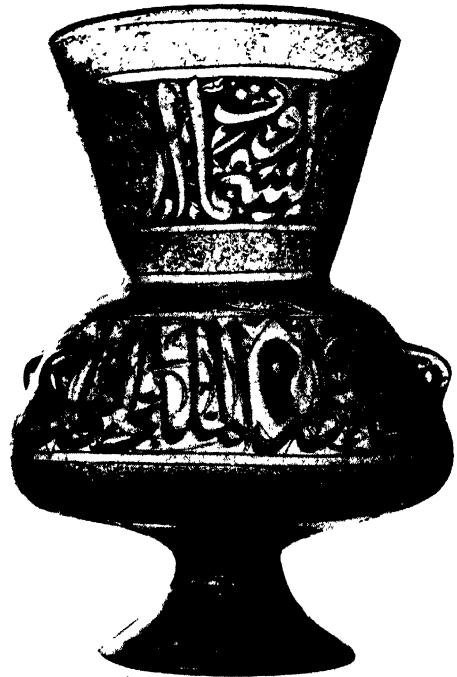
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COURTESY METROPOLITAN MUSEUM OF ART

### DISTINCTIVE EXAMPLES OF MOHAMMEDAN ART

1. A Persian bottle of the 17th century. 2. Persian plate of the 14th century. 3. Arabic sculptured marble vase. 14th century. 4. A Syrian mosque lamp of enameled glass dating from the 14th century.

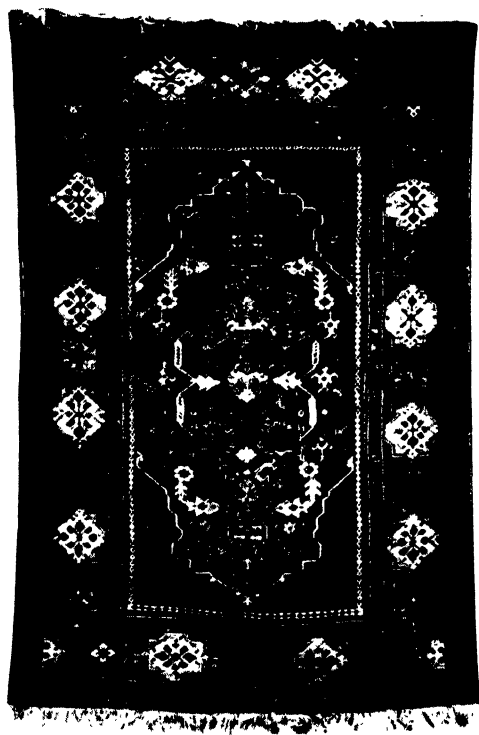
## MOHAMMEDAN ART



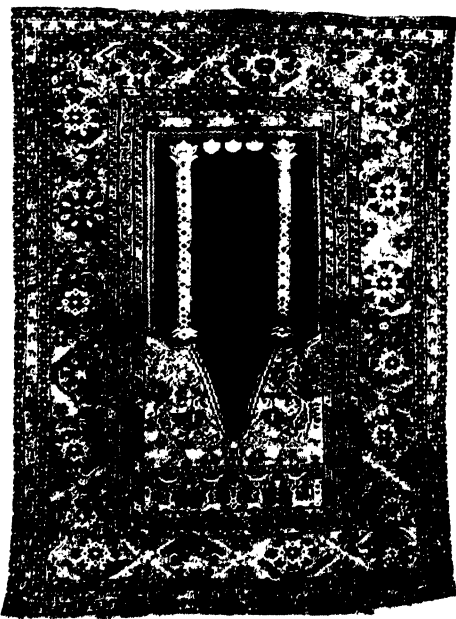
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COURTESY METROPOLITAN MUSEUM OF ART

### RARE ART OBJECTS OF MOHAMMEDAN COUNTRIES

1. Persian tile of the 14th century (about 1309).
2. Persian style tinted drawing of a hunting party by Ustâd Muhammadi. 16th century.
3. Turkish carpet, or Bergama praying rug. 17th century.
4. Turkish rug from Ghiordes. 18th century.

marble, or painted plaster, is often tastelessly over-elaborate. Certain tiled interiors are an exception; the tiles, coming at first from Persia, and later from Asia Minor, are entirely Persian in design and often preserve the combined richness and delicacy of the best Persian types.

From the 14th century on, Persian types of plan and, later, Turkish vault systems and details were dominant in Egypt. Thus the Great Mosque of Sultan Hassan, at Cairo, begun 1356, has a court surrounded by four enormous vaults of almost Persian type, and the high Persian outer dome is found in several examples. The finest of the later Egyptian domes are those due to the Mamelukes, especially the tomb of Barkuk, 1384-86, and the Great Mosque or Medrasseh of Kait Bey, 1372-74, with its gorgeous polychrome banded marble. The whole period is distinguished by a new vividness of color and lavishness of ornament, alike outside and in.

**Indian.** Mohammedan architecture in India shows especially well with what skill the Mohammedan conquerors of North India absorbed many elements of detail and structure from the local styles, and at the same time preserved their basic plan types. Thus the Mosque of Ajmir, 1200-36, is normal in plan but combines many Hindu and Jain elements in detail. Similarly, in the Tomb of Altamsh, in the Koutab Mosque, at Delhi, although Mohammedan pointed arches are used and Arabic inscriptions, the horizontally banded surface ornaments seem more Hindu than Mohammedan. Even the minaret of the Koutab Mosque, circa 1230, with its strong, vertical breaks, has typically Hindu character. Equally Hindu is the method of roofing polygonal or square spaces by a series of diagonal corbels.

The greatest period of Mohammedan Indian architecture is that of the Moguls during the 16th and 17th centuries. The Great Mosque at Agra and that at Futtipore-Sikri both have a richness of surface texture and a blending of Persian structural genius with Indian phantasy and delicacy that is extraordinary. This style reached its climax in palaces such as the Great Palace of Delhi, 17th century, and in tombs like the superb Tomb of Mahmud at Bijapore, with its enormous span and ingenious interlaced supporting arches, and the still more famous Taj Mahal at Agra, 1630-47, with its unbelievable richness of pierced and inlaid marbles.

The greater number of Chinese mosques remain consistently Chinese in structure and decoration, so that at first sight it is difficult to distinguish them from nearby temples.

T. F. H.

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**MOHAMMEDAN ART.** The Arabs, a nomadic people, practiced none of the arts and were willing to adopt the traditional styles of the countries they con-

quered. Consequently it was the mingling of different, and often distant, schools that evolved what is known as Mohammedan art. In architecture, the early mosque was an imitation of simple Christian churches in Syria and Babylonia, but as the dominions of Mohammed spread, the places of worship grew larger and more magnificent. The principle mosques were at MECCA, Medina, Cordova, Kairwan, Jerusalem, and CAIRO. When Egypt was subjugated, architecture received fresh inspiration, and splendid buildings were erected in northern Africa. In Cairo to-day there is a variety of public monuments characteristic of the different Mohammedan periods. Following the mosques, the palaces throughout the empire were modeled on the refinements of Persian taste. As builders, the people of Islam were famed for fortifications and hydraulics. Mohammedan art, in common with that of other eastern countries, was purely decorative as the Prophet himself had condemned the representation of the human form. There were, however, statues, portraits in fresco, and figures in manuscripts, but these were the work of Persians and Indians, patronized by unbelieving caliphs. The most usual motive in Mohammedan decoration was the arabesque, contrived in an endless variety. Coptic patterns were noted for their originality which took the form of conventionalized flowers, leaves and birds. In general, designs were intricate, for blank spaces were displeasing to Moslem tastes. Mohammedans were extensive travelers because of their pilgrimages to the holy places, and in consequence were enabled to study the art of the different provinces. This is probably the reason for the unity of style which connects the schools of the empire often quite distant from each other. In Egypt, the Copts produced damascened and enameled work and were adepts in glass-blowing, weaving, embroidery and lace-making. Ivory-carving, carried to a high degree, was practiced in all the Moslem countries and produced many works of art such as the caskets seen to-day in Spanish churches. The Persians and Indians were distinguished for their miniatures and the embellishment of manuscripts when the commands of the KORAN were set aside and human figures appeared in pictures. All the arts and crafts that had been followed from ancient times in Oriental countries by no means declined under Mohammedan rule. The weaving of textiles acquired a novelty of pattern as the Arabic characters were incorporated into the design. During the Middle Ages Spanish Moors and Venetians introduced Oriental carpets into western Europe. They were used in the state chambers of royalty and on the altars of churches, and are spoken of with wonder by contemporary chroniclers. The principal looms were at Constantinople, and to the present time Turkish carpets have enjoyed a steady fame. Persia, Anatolia and Mesopotamia each had its own method of WEAVING so that an immense variety of technique was obtained. Ceramics, an ancient craft in every country of the East, lost none of its beauty under Mohammedan practice.

**MOHAMMEDANISM**, or, exactly speaking, Islam, is the religion founded by MOHAMMED in the early 7th century, in Arabia. The word Islam means submission, to Allah, that is, and the satisfaction which comes thereby to the Moslem (Arabic *muslim*, one who has submitted). This religion numbers its adherents among almost all the peoples of the earth, and the total living membership may be 235,000,000, including the 500,000 Moros of the Philippine Islands. The greatest single body of some 70,000,000 is found in India. Arabia, Persia, Egypt and North Africa are almost altogether Moslem. Once the faith was politically dominant from Spain to India and inner Asia. When the Arabs were the leading Moslem race, they served as the channel, or the purveyors, of Eastern, especially Greek, culture to southern Europe and were largely responsible for the Revival of Learning.

Islam is both a religion, and a political system. Mohammed was the head of both State and Church, as were the khalifs for several centuries after him, until sultans assumed temporal power. There is now neither khalif nor sultan, but only the Sheikhu'l-Islam, or Grand Mufti, in Istanbul, as titular head of the faith. As a religion Islam is based upon certain articles of belief and enjoins certain practical duties, and thereby maintains its religious solidarity apart from full political independence. According to the orthodox Moslem doctors, there are six major articles of faith, or roots of Islam: (1) Allah alone is God, without a second; (2) Angels, beings with subtle bodies created of light, completely obedient to the will of Allah; (3) the KORAN (Qur'an, reading) as the complete and final word of Allah, given to mankind through the prophet of Allah, Mohammed; (4) Prophets, of whom the last and greatest was Mohammed, who from time to time have guided mankind in the truth of God; (5) Judgment which at the last sends man to Heaven or Hell, according to his deeds, for Allah is "in account" with men, and (6) God's omnipotence, understood by us somewhat in exactly as predestination. There are five major branches, or pillars of practical religion: (1) The belief and unhesitating profession that "there is no God but Allah, and Mohammed is the apostle of Allah"; (2) Prayer, or more specifically, five periods of prayer, daily; (3) The giving of the legal alms; (4) Fasting, especially during the month of Ramadhan, and (5) The performance of the pilgrimage to Mecca by all who have both sufficient means for the journey and for maintaining their families at home meanwhile.

Islamic morality has emphasized the brotherhood of believers, and the care of the needy; it has legislated against infanticide, private vengeance, suicide, robbery, inhumanity, usury, gambling, slander, perjury, the sale and consumption of intoxicating drink, and adultery; it has allowed polygamy, with the limit of four wives for any man at any one time, and slavery; it has recognized the place of JIHAD, or holy war, as an instrument in the spread of the faith.

Islamic law (*fiqh*, Canon Law) is based upon the Koran, tradition (*hadith*, or sayings of Mohammed),

analogy, and consensus of opinion. The development of Islam has been governed by tradition, in the general sense of the word; reason, and mystical interpretation. Many sects have formed during the centuries, all of which might be classified under two heads; the Sunnis, who profess to follow the plain *sunna*, or way, of the Prophet, and the Shi'a (*shi'a* means sect), who have claimed special privileges by reason of family relationship with Mohammed, or divine right of leadership. The Sunnis are about 90% of the total. Persia is the one great Shiite state.

J. C. A.

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**MOHANSIC PARK**, a state park created in 1922 with an area of 1,100 acres, located at Yorktown, Westchester Co., N.Y. Mohansic Lake, centrally located in the park, flows into the Croton Reservoir, forming part of the New York City water supply. The park has roads, paths, playgrounds, camp grounds, and golf courses.

**MOHAVE**, a North American Indian tribe, the most warlike of the peoples speaking dialects of the Yuman linguistic stock. In historic times they have occupied the east side of the Colorado River between Needles and the mouth of Black Canyon and are at present living in the same localities. The Mohave were agriculturists, but unlike neighboring tribes did not practice irrigation, depended little on hunting, lived in rectangular brush and earth-covered houses, and used reed rafts or balsas instead of canoes for river transportation. Bark and fiber were used instead of skin, some pottery was made, but baskets, when used, were obtained from other tribes. Politically they were loosely organized, though maintaining their tribal integrity. Socially the Mohave appear to have had a type of gentile organization.

**MOHAVE DESERT**, an arid region in southeastern California which lies just north of the COLORADO DESERT. The Mohave desert includes most of San Bernardino Co. and the eastern portions of Los Angeles and Kern counties and covers an area of approximately 15,000 sq. mi. The Tehachapi Mountains form the northern and western boundaries and the Sierra Madre and San Bernardino Mountains the southern boundary. The desert plateau starts at an elevation of 4,000 ft. at the west and gradually slopes down to 1,500 ft. or less at its eastern boundary, the surface being characterized by low mountains with intervening valleys and plains. The Mohave River which flows in a well-defined channel for about 50 mi. and then disappears completely in the desert sands drains most of the southwestern section of the desert. The rainfall averages only 5 or 6 in. per year because moisture-laden winds from the Pacific are intercepted by the high mountain ranges at the west. The desert in consequence is extremely barren and desolate. Vegetation is sparse and the smaller mountains are chiefly jagged piles of bare rocks. Saline sinks and dried-up lakes are numerous; the largest

are Dry Salt Lake, Harper Lake and Rosamond Lake and there are wide lava-covered areas with cinder cones and small craters. The most characteristic desert plants are the creosote bush, a low shrub, and the Joshua tree, a kind of yucca whose branches present a fantastic outline against the sky. Mesquite, paloverde, cat's claw, and many species of cactus are also found. In the very early spring, immediately following the period of winter rains hundreds of square miles of desert land blossom forth in the most amazing profusion and variety of vividly colored flowers. The transformation lasts but a few weeks, for these desert plants soon wither and disappear from lack of water.

The mid-day temperature of the desert in summer ranges between 70° and 125° F. In the few small areas where water can be obtained for irrigation, the Mohave has been found to yield good crops. The great Los Angeles aqueduct comes through the western part of the desert, supplying the city of Los Angeles with water from high in the Sierra Nevada. The desert is crossed by the Santa Fe and the Salt Lake railroads and by two U.S. Interstate Highways, one of which is part of the National Park-to-Park Highway.

**MOHAWK**, a North American Indian tribe, one of the members of the League of the Iroquois. They were represented in the federal council of the League by nine chiefs, three from each of the Mohawk clans. At the advent of the whites the Mohawk villages were in the Mohawk Valley, N.Y., from the environs of Schenectady to Utica. They claimed the district north to the St. Lawrence and southward to the watershed of Schoharie Creek and the easterly branch of the Susquehanna, where their territory adjoined that of the Mahican. The Mohawk played an important part in the Indian wars and in the consequent dealings with the settlers. In the American Revolution they were allied with the British. After the Revolution they moved to Ontario, Canada, where the remnants of the tribe still live, as well as at the St. Regis Mohawk Reservation in the western part of New York.

**MOHAWK RIVER**, a river of New York, the main western branch of the Hudson. It rises near the southern border of Lewis Co., flows southward to Rome and from this point eastward until it meets the Hudson at Cohoes, about 9 mi. above Albany. Not far from there are the Mohawk Falls, about 70 ft. in height. The basin of the river, estimated at 3,470 sq. mi., is formed by a broad depression between the Adirondacks and the Helderberg plateau. In Colonial days this Mohawk valley was the main highway to the Great Lakes and during the Revolution possession of it was hotly contested. The river is about 160 mi. long and has a fall of over 420 ft. Being paralleled by the Erie Canal and the New York Central railroad, it constitutes an important trade route between the Atlantic coast and the middle west. The cities of Rome, Utica, Little Falls, Fonda, Amsterdam, Schenectady and Cohoes are situated on its course.

**MOHUR**, a gold coin formerly issued in British India, equivalent to about \$7.00. It was used during the 19th century and was superseded by the sovereign.

**MOIDORE**, a gold coin issued by Portugal for about a century, beginning in 1640, and used in western Europe and the West Indies. It was equivalent to about \$3.23.

**MOISSAC**, a town in southern France, on the Tarn River, department of Tarn-et-Garonne. It is chiefly celebrated for the Romanesque cloister and the 12th century portal of the abbey church located here. Prior to the 16th century the abbey was very important. Moissac was badly damaged by a flood in 1930. Pop. 1931, 7,814.

**MOISSAN, HENRI** (1852-1907), French chemist, was born at Paris, Sept. 28, 1852. In 1879 he taught at the School of Pharmacy, Paris, became professor of toxicology there in 1886 and in 1900 professor at the Sorbonne. He introduced the use of the electric furnace in inorganic synthesis and worked upon compounds of silicon, chromium, iron and carbon. In 1886 he isolated fluorin and in 1893 he made some small synthetic diamonds. In 1906 he received the Nobel Prize in chemistry. He died at Paris, Feb. 20, 1907.

**MOISSANITE**, a naturally occurring form of CARBORUNDUM, silicon carbide, found only in METEORITES. Henri Moissan (1852-1907), the French chemist after whom it was named, discovered it in small, green, hexagonal plates, associated with microscopic DIAMONDS, in the iron meteorites from Canyon Diablo, Ariz. See also HEXAGONAL SYSTEM.

**MOISTURE**, in meteorology, indicates the water vapor in the atmosphere and causes the HUMIDITY of the air.

**MOJAVE**. See MOHAVE.

**MOLALA**, a North American Indian tribe speaking a language of the Waiilatpuan linguistic stock. They are not well known, though it is assumed that a few survivors may have been integrated with the tribes now on the Grande Ronde Reservation. They appear to have lived formerly in the Cascade Range between Mts. Hood and Scott and on the western end of the Cascades in Washington and Oregon.

**MOLASSES**, a relatively thick, heavy-bodied product from sugar-plant juice made by clarifying and evaporating until more or less sugar is crystallized. The product remaining, after separation and removal of the sugar, is molasses.

Edible molasses usually contains more dissolved sugar, and is therefore sweeter, lighter colored and better flavored than molasses from which more sugar has purposely been removed during manufacture. It is sometimes used as a syrup.

Baking molasses may possess relatively mild or strong flavor and light or dark color. More sugar has usually been removed during manufacture in producing the darker colored and more strongly flavored molasses. Examples are Louisiana, Barbados, Porto Rico and West Indies molasses. These vary in flavor and color, depending primarily on the method of

clarification and evaporation of the sugar-cane juice. Some Barbados molasses, strictly speaking, is a syrup, made to possess molasses-like flavor.

Blackstrap is the lowest grade molasses from which all sugar that can economically be removed by crystallization has been recovered during sugar manufacture.

Sugar-cane molasses is made from sugar cane; beet molasses from sugar beets. Sorghum molasses, correctly speaking, is not a molasses, although often so called because of its molasses-like color, flavor and density. *See also* SYRUPS. C. F. W.

**MOLCHO or MOLKO, SOLOMON** (c. 1500-32), Portuguese Marrano, Cabalist and Messianic enthusiast, was born about 1500. Though born a Portuguese Marrano (New Christian), later, influenced by the teachings of DAVID REUBENI, he determined to profess Judaism openly. However, at the latter's advice, he went to Salonika, Turkey, where he studied Cabala. Soon thereafter he went to Safed, Palestine, then the center of Cabala. Convinced of the imminent coming of the Messiah and the overthrow of Rome, he went to Venice in 1530, later to Rome, where he gained a great following, and preached in the local synagogues. Jews in Asia, Hungary, Poland, Portugal and Turkey regarded Molcho as the Messiah, or at least as the forerunner of the Messiah; this belief they cherished even after his death, only to have all their Messianic hopes in him disappointed.

When Jacob Mantino, a prominent Jewish physician, denounced him to the Inquisition, he fled to Germany in order to escape the sentence of death. Later he was apprehended, extradited to Mantua, and burned at the stake in 1532, after he had refused the opportunity of securing clemency through a return to Christianity. After his death dozens of legends were associated with him, showing how intense were the Messianic hopes which he aroused in the minds of the Jews of Italy and Turkey especially. Molcho would appear to have been the only sincere pseudo-Messiah in Jewish history. A. SH.

*See* Graetz, *History of the Jews*, 1926.

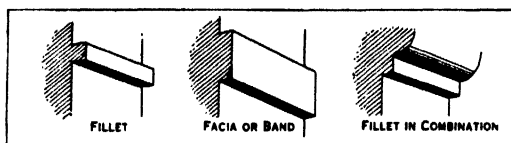
**MOLDAVIA**, an autonomous republic formed in 1924 as a separate republic of the Ukrainian S.S.R., situated on the Dniester River. Area 5,180 sq. mi. The population in 1926 was 572,000, and consisted mainly of Ukrainians and Moldavians, with some Bulgarians, Poles and Germans. Moldavian Jews are increasing rapidly; in the northern part of the country there are a few purely Jewish towns, recalling those of Poland. The principal industry is agriculture; maize, wheat, sugar beet, rye and tobacco are cultivated. After the World War the inhabitants claimed cultural freedom from Russia, and the autonomous Moldavian Socialist Soviet Republic was formed and linked administratively with the Ukraine. Birzulav is the capital.

**MOLDING**, in architecture and ornament, (1) the modulation of a surface in a band, usually continuous, whose profile is either approximately continuous through the entire length of the band or varies with a rhythmic repetition; (2) a small strip, either square

or curved in section, used in paneling, metal work and furniture, to cover a joint between two members or to decorate an edge or corner.

**Classifications.** Moldings are usually classified and named according to their section; thus, there are straight moldings composed only of flat faces, and curved moldings.

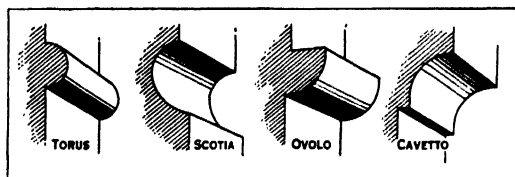
**Flat Moldings.** The common flat moldings are: 1. Face or facia, a flat band of appreciable width, either slightly projecting from or slightly indented into the surface which it decorates. Unless otherwise speci-



TYPES OF STRAIGHT MOLDING

fied, the plane of the facia is usually parallel to the plane of the original surface. 2. Fillet, a narrow facia, commonly used to subdivide other moldings. 3. Chamfer, a diagonal fillet or facia produced by cutting off a projecting edge from a beam, post or other similar member.

**Simple Curve Moldings:** 1. Ovolo, a convex projecting molding with a section approaching a quarter-circle, a quarter-ellipse, or a similar curve. 2. Cavetto, a concave projection molding with a section approaching a quarter-circle, a quarter-ellipse, or a similar curve.



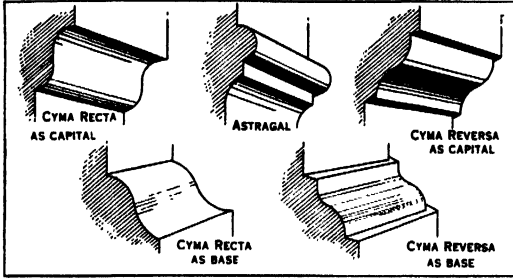
TYPES OF CURVED MOLDING

3. Torus, a convex projecting molding with a section approaching a semi-circle or semi-ellipse.

**Compound Curved Moldings:** 1. Cyma Recta, a projecting molding whose section is partly convex and partly concave, with the direction of curve at top and bottom approaching a horizontal line. The cyma recta is often used for both cap and base members; as a cap, the concave, most projecting portion is at the top, and the convex below; as a base, the reverse is true. 2. Cyma Versa, a projecting molding whose section is partly concave and partly convex, in which the section curve approaches a vertical line at top and bottom. This, like the cyma recta, is found both as cap and base, and both types of molding are also frequently used as panel molds or as important parts of architraves, door- and window-trims, and the like. An *apophye* is the outward swelling at the base and cap of a column with a profile of a generally cavetto type. An *astragal* is a combination of a small torus with a small fillet beneath it; in columns, an astragal frequently crowns the apophye. A modification of

the cyma reversa, in which the upper convex surface and the lower concave surface are not continuous in curvature, but meet in a sharp edge, is called a thumb molding, or sometimes a bird's beak molding.

Two cyma reversas, back to back, with their lower parts connected by a fillet, are sometimes called a keel molding, from the fancied resemblance of the



TYPES OF COMPOUND MOLDING

combination to the cross-section of a ship's hull and keel. The keel molding is frequently used on the underside of Gothic arches and vaulting ribs.

**Molding Decoration.** Moldings are frequently decorated with painting or carving; generally, good molding decoration is that in which the lines of the decoration seen in any perspective most harmoniously accent the profile of the molding. The Greeks at an early period developed characteristic painted patterns for each of the regular classic moldings, and from the early 5th century B.C. frequently carved similar decorations. These were adopted and developed by the Romans, and taken over by the Renaissance designers throughout Europe. They are: On the ovolo, the EGG AND DART, in which round, egg-shaped forms surrounded by a frame are separated by thin dart or arrow shapes; on the cavetto, delicate vertical leaves or scales; on the torus, either a succession of projecting fillets, wreath-forms of narrow, parallel leaves, or the GUILLOCHE; on the cyma recta, either acanthus leaves or combinations of the anthemion with acanthus forms; on the cyma reversa, the water leaf, somewhat similar to the egg and dart in general idea but with flatter, conventionalized leaf forms taking the place of the eggs, and with the outline of the leaf similar in character to the profile of the molding. In a more complicated Roman form, used on larger work, the single leaf and the dart between are both replaced by rich, foliated forms or combinations of flowers and leaves.

**Historical.** Moldings were first naturally developed by those peoples building in stone or wood; thus we find two great centers in Egypt and the Aryan North. The chief Egyptian running molding was the cavetto cornice, with a small torus beneath it; column capitals show various convex molded forms. The Greeks of Ionia worked out the other, northern tradition (seen also in the work of the Hittite Empire and Persia) to its climax in the Ionic order, and Greek work generally saw the fusion of the two streams

from Egypt and the North. Greek moldings are of the most exquisite subtlety, with sections approaching conic rather than circular curves. Roman moldings are usually larger in scale, and more powerful if less refined in section, tending to more circular curves. Minor Roman work, such as that in Pompeii, shows the most extraordinary variety of invention, with many inclined faces and fillets and occasionally deeply incised hollows.

Syrian tendencies towards flat moldings, with lace-like, incised decoration were apparent in Roman work as early as the 3d century; their complete dominance characterized all Byzantine molding design, in which flat, splayed surfaces replaced the classic cyma and the ovolo was almost completely absent. Further west, the civilization which grew up after the Dark Ages borrowed some of its moldings from Byzantine and some from Roman precedent, but rapidly created additional forms of its own. In general, many moldings are used together in doorways, arches, and the like, and decorations for them were developed, based either on geometric forms, like the zigzag, or on grotesques. An apparently endless invention is found in these decorations.

Gothic moldings merely carried this freedom and inventiveness still further. The French particularly liked convex forms, such as the roll molding, or bow-tell, until the flamboyant period, when all sorts of combinations of cyma shapes with delicate fillets, deep hollows, and elongated keel motives are found. English Gothic moldings were, on the other hand, infinitely varied from an early period. Arch moldings especially consisted frequently of the most fanciful collection of convex and concave forms, large and small, sometimes without a single face or fillet in the entire width of the combination.

The Renaissance return to classic precedent prevented much invention of molding forms; but the Baroque, especially in its later phases, delighted in new combinations of curved surfaces, especially favoring an oval-shaped molding or bold projection such as that found commonly in Louis XV door trims and the like.

Of the Asiatic peoples, the Indians have been by far the most prolific in molding design, and Indian architecture from the earliest days up to the 17th century is famous for the extraordinary wealth of richly decorated moldings of all varieties, which band so many of the temple structures. In the early work, Hellenistic influence may be inferred. A somewhat similar molding richness typifies the Indonesian work of the Malay Peninsula and the nearby islands; especially noteworthy are the Khmer buildings at Angkor Wat and such Javanese temples as Borobudur. Chinese and Japanese work, on the other hand, uses moldings sparingly except for characteristic ovolo type cap and base molds on the masonry foundations of wooden temples and in connection with statue and stele bases.

Free modern design, both in Europe and the United States, due to its usual insistence on economy and functional expression, has little use for moldings as

important architectural members. In minor elements, however, such as door frames and decorative spots, great inventiveness in molding treatment is found.

T. F. H.

**MOLE**, a small insectivorous mammal of which two chief varieties are found in the northern United States. These are the common mole (*Scalopus aquaticus*) and the star-nosed mole (*Condylura cristata*). The latter gets its name from a peculiar circle of fleshy projections which tip its nose. Several different varieties are scattered over the remainder of the Northern Hemisphere.

In general, moles are small burrowing animals 5 or 6 in. long, with soft close fur, rudimentary eyes, no external ears, powerful fore limbs for digging, and a long pointed nose. They live almost entirely on earthworms and insects and in seeking these make the burrows so unsightly on fine grass lawns. They eat very little vegetable food. The mole is usually dark or silvery gray and the skin, though very delicate, is used for fur coats. A moleskin coat of ordinary size requires almost a thousand skins. The young moles, from 4 to 6 in number, are born in an underground chamber.

A. R. F.

**MOLE**, in engineering, a modified BREAKWATER.

**MOLECULE**, an elementary particle of MATTER comprising a cluster of ATOMS. The science of chemical reactions deals with the breaking apart and the re-formation of these clusters. When collected together in large numbers, they make up an object, or body of matter. For example, the sub-microscopic particles of water consist of one OXYGEN and two HYDROGEN atoms bound together to form a water molecule. A molecule of ordinary table salt consists of an atom of SODIUM and an atom of CHLORINE bound together to form a molecule of sodium chloride.

AVOGADRO has pointed out that there is the same number of molecules in a cubic centimeter of any gas at a given temperature and pressure. When the internal structure of a molecule is disturbed, heat and light are radiated (see RADIATION, THEORY OF) in the form of a series of band spectra (see BAND SPECTRUM).

**MOLECULES, ASSOCIATION OF.** See AGGREGATION.

**MOLE DRAINS**, underdrains adaptable to localities where the soil is a clay or clay loam. It is constructed by a mole plow, which makes a 3 to 6 in. tunnel in the soil at a depth of from 2 to 2½ ft. A mole drain must have a uniform slope, which limits its use to comparatively level or uniformly sloping land. In rocky or sandy soils, or where stumps occur, this type of drain is not feasible.

**MOLIÈRE, JEAN-BAPTISTE POQUELIN** (1622-73), French comic dramatist, was born in Paris probably on Jan. 15, 1622. His father was a tapestry dealer, and the son was destined for the same trade. He proved a good scholar, and at the age of 19 took up his father's occupation but, disliking it, began to study law at the University of Orleans. He returned to Paris and joined a company of actors, this step provoking his father's wrath and compelling him to

adopt another name, that of Molière, in place of the family name of Poquelin. From 1646 to 1658 he toured the French provinces with his company, playing in country houses, in inns and barns, and submitting to discomforts, privations and humiliations. In 1658 he brought his company to Paris and, playing before Louis XIV, was fortunate enough to amuse that king and secure his patronage. Molière's first outstanding success came in 1659, when he played in his own piece, *Les précieuses ridicules*. The comedy created a furor and provoked imitations. Other comedies followed, among the most popular being *L'Ecole des maris*, 1661, *L'Ecole des femmes*, *Le Misanthrope*, *Tartuffe*, *Georges Dandin*, *L'Avare*, *Le bourgeois gentilhomme*, *Les Femmes Savantes* and *Le malade imaginaire*, 1673. In 1662 he had married Armande Béjart, a young actress in his company, and his relationship to her remains even today a matter of controversy. Molière had been the lover of Madeleine Béjart, and it is still uncertain whether Armande was the daughter or sister of Madeleine. There is evidence to support both suppositions, but when slander began to heap itself about Molière's name, Louis XIV, so French traditions assert, showed what he thought of it by inviting the actor-dramatist to sit at table with him. Nevertheless the marriage was extremely unhappy and contributed much to Molière's constitutional melancholy, the greatest comic genius the world has ever known being by nature a man who was the reverse of merry. He died at Paris, Feb. 17, 1673, and was buried at night to escape the interference of ecclesiastical authorities who did not consider an actor fit for burial in consecrated ground.

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**MOLINE**, a city of Rock Island Co., Illinois, on the Mississippi River, 175 mi. southwest of Chicago. It is one of the group known as "Tri-city," comprising Moline, the adjacent ROCK ISLAND, and DAVENPORT, across the river in Iowa. It is served by several railroads, including the Burlington and the Rock Island lines, steamboats and an airport. The city has outstanding manufactures of agricultural equipment, notably steel plows, whence it derives the name "the plow city." In 1929 the value of the factory output was about \$44,000,000; the retail trade amounted to \$20,751,557. John Deere, who invented the steel plow, came to Moline in 1847 and set up business on a small scale. There are coal mines in the vicinity. The settlement of Moline began about 1832; it was plotted in 1842 and incorporated in 1848. Pop. 1920, 30,734; 1930, 32,236.

**MOLINIER, AUGUSTE** (1851-1904), French historian, was one of the most learned of French medievalists during the last quarter of the 19th century. After graduation from the École des chartes in 1873, he was for 20 years archivist at different important libraries. In 1893 he became professor at the École des chartes, and immediately exerted a great influence on the trend of medieval scholarship. He published numerous works on the history of Languedoc,



notably in the form of scholarly notes and appendices to the massive Benedictine *Histoire générale du Languedoc* (1874-86). His editions of the texts of various medieval chronicles gave him a high ranking in the scholarly world. His most valuable work, the *Sources de l'histoire de France, 1 ère partie, des origines aux guerres d'Italie* (6 vols. 1901-1904), gives an accurate and fairly complete collection of source materials for medieval France. In volume V, Molinier wrote a brilliant survey of the growth of historical scholarship and instruction in France, which he himself had done so much to direct. He was connected with the *Review historique* from its beginning, acting as the editor of the medieval section. Molinier died in 1904.

**MOLINO DEL REY, BATTLE OF**, Sept. 8, 1847, one of the final engagements of the MEXICAN WAR. Supposing a cannon foundry and an ammunition magazine to be at Molino del Rey, a group of stone buildings three miles southwest of Mexico City, Gen. Winfield Scott directed Gen. Worth with 3,100 troops to attack. The fortifications were defended by a force of 4,000, whose artillery fire held the Americans at bay for a time. In hand-to-hand fighting the Mexicans were routed, and the American army held the fortifications despite the arrival of reinforcements sent the Mexicans by Santa Anna. The Mexican casualties were about 3,000, and 690 were taken prisoners. The American casualties were 787 killed and wounded.

**MOLLUSKS**, the common name for members of a large group or phylum (Mollusca) of invertebrate animals. Typical forms are characterized by the possession of a calcareous external shell, which may be univalve, all in one piece, as in snails, or bivalves, consisting of two halves joined by a hinge, as in oysters. In the cephalopods, however, the shell is often internal and reduced to a mere vestige. It is secreted by the mantle, the upper part of the integument which folds about the body. Lower down the integument forms a foot.

There are over 60,000 species of mollusks, varying in size from the giant squid, 50 ft. long, which is the largest invertebrate animal, to tiny snails a fraction of an inch across. They live in both salt and fresh water, and on the land. Some species feed on seaweeds; others are carnivorous; still others are omnivorous. They are divided into five classes as follows: (1) Amphineura—Chitons. (2) Gastropoda—Water and land snails and slugs. (3) Scaphoda—Marine tusk shells. (4) Lamellibranchia—Oysters, clams, mussels, scallops, all water dwelling. (5) Cephalopoda—Squids, cuttlefish and octopods, all marine.

Many mollusks are of great economic importance. Certain oysters, clams, scallops and mussels are eaten wherever they occur. Snails, squids, cuttlefish and octopods are also good food, and commonly used in many places. The shells of mollusks provide such various things as pearls, "mother-of-pearl" and the cuttle bone given to cage birds. *See also* CHITON; CLAM; CONCH; CONE-SHELL; COCKLE; CUTTLEFISH; OCTOPUS; OYSTER; SCALLOP.

A. I. W.

**MOLLY MAGUIRES**, a secret order of obscure origin, chiefly notorious for terrorism in the anthracite district of Pennsylvania, in 1867-76. During the Civil War the brisk demand and high prices for anthracite coal caused a large influx of foreigners into the colliery towns. Out of this social and industrial confusion the Irish element, through the medium of the Molly Maguires, became dominant. Judges were overawed, mine superintendents assaulted, and several murders committed. A Pinkerton detective, James McParlan, posing as a fugitive from justice, was inducted into the Order, and accumulated evidence which led to the conviction of several members for murder and ultimately to the breakdown of the organization.

**MOLNAR, FERENC** (1878- ), Hungarian writer, was born at Budapest, Jan. 12, 1878. His earliest works were written in Hungarian, and included *Magdolna*, 1900, *Jozsi*, 1902, and *Eva*, 1903. In 1907 he began his series of plays with *Der Teufel*, 1907, obviously inspired by the works of OSCAR WILDE. *Der Leibgardist*, 1910, *Liliom*, 1910, and *The Guardsman*, 1911, had great success in Germany. The Theatre Guild of New York staged a memorable production of *Liliom* in 1921. *Fasching*, 1917, and *Spiel im Schloß*, 1927, and *Reunion in Vienna*, 1931, were later successes in the theater.

**MOLOCH**, a grotesque lizard inhabiting sandy regions of southern and western Australia. Although only about 8 in. in length, this remarkable reptile attains a degree of spinosity rivaled only by the so-called horned toads of the southwestern United States and Mexico. These lizards, belonging to different families, are often cited as examples of parallel evolution or a case of similar environments producing like results on fundamentally different framework. The moloch (*Moloch horridus*) is quite harmless and eats ants. It lays its eggs in sand or loose soil.

**MOLT**, the loss by a shedding or scaling, of the outer integument or body covering. The term is used especially of the periodic loss of feathers in birds, but is also applied to shedding of hair, horns or antlers in animals, or, in the case of reptiles, of the entire skin. In crustaceans and insects, an old dead integument is replaced by a new skin, the removal of the old and the formation of the new being achieved by bodily secretions. Lobsters shed their outer shells even after maturity. Caterpillars cast off the old skin at regular intervals before taking the chrysalis form, while pupae discard the protecting larval skin. Birds, molting at two seasons, usually achieve one complete and one partial change of plumage. The incomplete molt, which precedes mating, does not affect the wings or tail; the complete change follows the breeding season and extends over four to six weeks. Young birds may molt repeatedly before acquiring full adult plumage.

**MOLTKE, HELMUTH CARL BERNHARD, COUNT VON** (1800-91), Prussian field marshal, was born at Parchim in Mecklenburg, Oct. 26, 1800.

Of a noble family, he grew up in straitened circumstances, and in 1835 after a varied military life, entered the service of Turkey. His travels and explorations at this time he afterward described in a collection of letters. In 1857 he became chief of staff of the Prussian army, but it was not until the Danish Campaign, 1864, that he had an opportunity to display his great military talents. Two years later, in the war against Austria, he proved himself to be one of the great generals of the century. In the Franco-Prussian War, 1870, he had complete control of the army and his brilliant strategy brought that struggle to a close in a few months. He was created count (1870), and field-marshal and member of the Reichstag (1871). He died Apr. 24, 1891.

**MOLUCCAS**, or **SPICE ISLANDS**, an archipelago of the Dutch East Indies, comprising the islands of Amboina, Gilolo, Buru, Ceram, Ternate, Waigeu, Ombira, Morotai, Misol, Aru, Kei, Banda, Sula and a number of less important ones. The Equator runs through the archipelago which is between the islands of Celebes and New Guinea, and comprises an area of about 22,000 sq. mi. Most of the islands are volcanic in origin and a few still contain active volcanoes. The highest elevation in this series of islands is Mt. Musa Heli on Ceram. It rises 10,000 ft. above the water.

Many spices are native to the Moluccas. Besides coffee, rice, tobacco, cacao and indigo, various fruits are profitably cultivated. Of minerals sulphur is the principal. There are deposits of coal, tin and petroleum. The forests are alive with little-known birds and animals, the mound-builder, cassowary and bird-of-paradise and shrew, wild pig, flying opossum and cuscus. A special variety of butterfly found here is noted for its size and the remarkable coloring of its wings.

The islands of Amboina and Ternate are the commercial centers and the most active places of the archipelago. The town of Amboina, located on Amboina Island, is the largest and most important commercially. Most of the inhabitants of the Moluccas are Malays, Alfuras, Papuans, Chinese and Japanese. The bulk of them belong to the Mohammedan religion. There are very few Europeans. Natives live mainly on the pith of the sago palm. This article, together with the spices and coconuts, constitutes the chief export.

By a treaty in the latter part of the 15th century the Spaniards were the first Europeans to establish their right to the Moluccas. The Portuguese purchased the archipelago and held it till the beginning of the 17th century when the Dutch came in. In 1605 the latter made Amboina the principal station of the Dutch East India Company. With the acquisition of the Moluccas they also annexed Celebes, part of New Guinea and a number of smaller islands belonging to the sultans of Ternate and Tidore. All the islands of the archipelago, including Dutch New Guinea, are under the government of the Moluccas. The combined population is estimated at 400,000.

**MOLY**, a fabulous herb reputed to possess magic power, anciently described as rising from a deep black root and bearing flowers of milky whiteness. Homer relates that Hermes gave the moly to Odysseus to counteract the spells of Circe. A species of garlic (*Allium Moly*), native to southern Europe and sometimes grown in rock gardens, is called moly.

**MOLYBDENITE**, a bluish, lead-gray mineral of metallic appearance and greasy feel, the chief ore of molybdenum. It is the molybdenum sulphide, crystallizing in flat, hexagonal crystals. Molybdenite occurs in granular or scaly masses in granites, pegmatites, veins and some metamorphic rocks. It is used to harden steels and its compounds serve to color pottery and to make pigments and chemical reagents. United States, Canada, Norway and Australia are important producers of molybdenum. Colorado is a productive American locality. *See also* HEXAGONAL SYSTEM; ORE DEPOSITS.

**MOLYBDENUM**, a silvery metallic element, symbol Mo, having the atomic weight, 96.0; density, 10.3; melting point, 2625° C., occurring in nature in the form of ores. The largest deposits are in the United States (Colorado) where it occurs chiefly as molybdenite, MoS<sub>2</sub>. The ore is roasted, driving off the sulphur and forming molybdic oxide, MoO<sub>3</sub>. This is treated to form calcium molybdate or ferro-molybdenum which are used in steel making. The steel industry is the largest consumer of molybdenum. It increases the ductility and toughness of steel, and increases the impact and resistance to fatigue and raises the tensile strength. It is used largely in aircraft and automotive steels, also in some alloy cast irons, and replaces tungsten in high-speed steels. A new nickel-molybdenum-iron alloy resists the action of hydrochloric acid better than any other known alloy. Considerable amounts of molybdenum are used in the radio industry as sheet and wire; wire is also used in small resistance furnaces. A small amount is used in the manufacture of dyes and chemicals. *See also* IRON.

C. H. H.

**MOMBASA**, chief port and capital of KENYA Colony, British East Africa, is situated on Mombasa Island, 150 mi. north of Zanzibar. The city, which is connected with the mainland by a causeway and is the terminus of the Kenya and Uganda Railway, contains several impressive Mohammedan, Hindu and Parsee temples and Roman Catholic and Anglican churches. Except for the main thoroughfare, the streets are narrow and winding and the whole aspect of the city is oriental. The principal articles of export are rubber, copal, ivory, grain and hides. The Portuguese occupied Mombasa at the end of the 15th century. In 1823, the British assumed protection, but in 1837 the city passed into the hands of the sultan of Zanzibar. Not until 1887 did Great Britain re-assume the protectorate. Est. pop. 1929, 50,000.

**MOMENTUM**. *See* IMPULSE OF A FORCE.

**MOMMSEN, THEODOR** (1817-1903), German historian of Rome. He was born Nov. 30, 1817 at Garding in Schleswig. On completing his university

training at Kiel he devoted himself to Roman studies. After holding professorships at Leipzig and Zurich, in 1858 he was appointed to a professorship at Berlin. His contributions to our knowledge of Rome are enormous. Under his direction the great *Corpus Inscriptionum Latinarum* was published. In his *Römisches Staatsrecht*, 1871-76, he made an exhaustive study of Roman constitutional law, and in the same way he investigated Roman criminal law in his *Römisches Strafrecht*, 1899. He wrote a *History of Roman Coinage*, 1860. The works best known to the general reader are his *Roman Provinces*, 1884, and especially his *History of Rome*, 1854-56, both of them translated into English. Mommsen's prodigious learning, original judgment, and prolific writing have given him a preeminent position among scholars of our time. He died at Charlottenburg, Nov. 1, 1903.

**MOMORDICA**, a genus of climbing herbs of the gourd family, two species of which are widely grown for ornament and to some extent for food. There are about 40 species native to the tropics of the Old World. The balsam-apple (*M. Balsamina*) and the balsam-pear (*M. Charantia*) are slender high-climbing porch vines with showy flowers and fruits. The seeds of the latter are used as an ingredient in curries and also in medicine.

**MONACO**, a small independent principality located on the Mediterranean to the east of NICE. Its present ruler is Louis II, Prince of Monaco, who assumed the throne in 1922. From 968 it belonged to the House of Grimaldi. During the French Revolution in 1792 the Prince was driven out but the principality was again reestablished in 1814, becoming in the following year a protectorate of Sardinia. In 1848 the cities of Mentone and Roccabruna revolted and in 1860 Nice went to France. Since 1861 the French influence has been dominant.

Monaco has an area of 370 acres and a population, according to the census of 1928, of 24,927. The three largest cities, Monaco, with a population of 2,085; La Condamine, 11,787; and Monte Carlo, 11,055, constitute municipal governments for its three districts. The chief exports are olive oil, oranges and perfumes, and the imports are coal and wine.

In the government of the principality the prince is assisted by a ministry and a national council. In 1911 the present constitution went into effect. The council consists of 21 members elected for four years by universal suffrage. In 1930 the prince dismissed the council and began ruling without its aid. Much of the revenue of the principality is derived from the gambling tables of Monte Carlo.

**MONAD**, in philosophy, an atom; an inextended and more or less conscious substance, a center of force. The first conception is the original Greek notion associated with the atomists (see **ATOMISM**); the second is that of GOTTFRIED WILHELM LEIBNITZ, with whom the term is most commonly identified. BRUNO had developed a theory somewhat similar to that of Leibnitz (1646-1716), but there is some dispute as to the extent of Leibnitz's indebtedness to him.

Reality for Leibnitz consists of monads, or inextended centers of force. These monads have an independent existence, and each mirrors the universe. There are various levels of monads, culminating in the supreme monad. The independent existence and yet harmonious relation between the monads led Leibnitz to his doctrine of preëstablished harmony. His illustration of the two clocks keeping perfect time with one another although each was entirely independent has become classic.

**MONADNOCK**, isolated hills, or low mountains of hard rock, upstanding conspicuously above a region otherwise reduced by erosion to a plain, or peneplain. Monadnocks represent the most resistant rocks of a mountain system in its old age. They take their name from Mt. Monadnock, in New Hampshire, which was first recognized as a remnant feature of this type. The famous Stone Mountain, in Cheyenne County, Georgia is a typical monadnock.

In some instances monadnocks owe their resistance to the intrusion of hard volcanic rock, as in Mt. Tom and Mt. Holyoke, in the Connecticut Valley, and East and West Rocks, New Haven. Denuded volcanic plugs, or necks, rising abruptly from a plain, like Mato Tepee, or "Devil's Tower," Wyoming, are by some geologists classed as monadnocks.

**MONADNOCK, MOUNT**, a rugged granitic peak in Cheshire Co., southwestern New Hampshire, about 10 mi. southeast of Keene. The mountain stands out in bold and isolated grandeur as a conspicuous landmark which can be seen from the dome of the State House in Boston, Mass. Its precipitous walls rise 3,186 ft. and the summit commands a superb view. The base covers an area measuring 5 by 3 mi. The mountain is of typically erosive character. The State of New Hampshire has converted 493 acres into a park and has built a road to camping and parking places, and there are excellent trails leading to the top of the mountain.

**MONAGAS, JOSÉ TADEO** (1784-1868), Venezuelan soldier and statesman. He served in the wars of independence and became a member of the constitutional convention in 1830, when Venezuela broke away from Great Colombia. He was president from 1847 to 1850, switching after election from the conservative to the liberal party. During his second term as president, 1855-1858, he developed dictatorial ambitions and promulgated a new constitution, providing for a strongly centralized government. This united all factions against him, and he was forced to resign in 1858. Monagas died in 1868.

**MONARCHIANISM**, a theological term given to a doctrine maintaining the unipersonality, or Divine monarchy, of the Deity, as opposed to the orthodox Church doctrine of the Trinity. Monarchianism, which flourished within the Church during the 2nd and 3rd centuries, took the following three forms: (1) Modalistic Monarchianism, which held that Father, Son and Spirit are not distinct persons of a trinity, but are rather successive phenomenal forms, or modes, of the same essence; (2) Subordinationism,

which, though recognizing Father and Son as distinct persons, denied their coexistence and coequality, maintaining that Christ was a mere man adopted by God as his Son; (3) Patripassianism, the belief that it was God the Father who became incarnate and died on the cross.

**MONARCHY.** See GOVERNMENT.

**MONARDA**, a genus of handsome herbaceous plants of the mint family, several of which are commonly called horsemint. There are about 20 species, all natives of North America, several of which are sparingly grown for ornament. Among the best known are the OSWEGO-TEA (*M. didyma*), of the eastern United States and adjacent Canada, with large showy scarlet-red flowers, and the wild bergamot (*M. fistulosa*), with smaller, purple flowers, found across the continent. Several species yield thymol, widely used in medicine.

**MONASTICISM**, an institution found in several religious systems. This article is concerned only with Christian monasticism, and, more particularly, with that of the Western Church. In general, the monastic ideal is a life of renunciation, of discipline; with poverty, chastity (involving celibacy), and, at least in cenobitic monachism, obedience, as its threefold vow. Ascetism, spiritual discipline, is an integral part of Christianity; the monk was an ascetic who felt called upon to abandon "the world" and to endeavor to attain to the ideals set forth in the "counsels of perfection."

The earliest Christian monks were solitaries who fled to the desert and there spent their lives in religious exercises accompanied by acts of extraordinary physical austerity. "Athletes of Christ" they were called; and often they engaged in what may be described as a sort of rivalry in ascetic practices, endeavoring to live with less sleep, to fast for longer periods, or to spend daily a greater number of hours in prayer or the recitation of the psalter than did other ascetics. The Rule which served to fix the usages of Eastern monachism and to give it a cenobitic rather than an eremitic form was the work of St. Basil the Great (see BASILIAN MONKS); but even to-day the eremitical life survives in the Orthodox Eastern Church. The monks spend a large part of their time in the recitation of services, and physical ascetism is emphasized. Three days a week are fast days—for even the Pharisees fasted twice in the week.

The norm of Western monachism was the rule of St. Benedict (see BENEDICTINES), who acknowledged his indebtedness to St. Basil, but stressed spiritual ascetism rather than bodily, and directed that his monks should have adequate food, sufficient sleep, and ample clothing. So far as the hardship of the life was concerned, it is probable that the early Benedictines were as well fed and clothed as they would have been had they remained in the world. The monk had no personal possessions, but the community was not debarred from holding property. Poverty is a relative term; the life of the convent was to be the life of poor folk, not a life of destitution.

The sanity and moderation of the Rule of St. Benedict must account in large part for the fact that Benedictine monachism so supplanted other forms in western Europe that by the close of the 8th century it was doubted whether one who was not a Benedictine could be a monk. Celtic monasticism, with which the Benedictine came in contact not only in the British Isles but on the continent as well, was more austere in its ascetic practices. The Celtic monks were the ruling element in the Irish Church; they earned a high reputation for holiness of life; their missionary activities were filled with heroic exploits. The Benedictine emphasis on the "monastic family," and the doctrine of stability—which means that a monk became and remained a member of a particular monastery—left no place for wandering monks and vagrant holy men. If individual Benedictines did not parallel the feats of Celtic monks, the quiet and ordered discipline of the monastic family was, in the main, the more effective.

The chief business of the monk was prayer; his work was the *Opus Dei*—the recitation of the divine office. But closely coupled with this was manual labor. The solitaries in the desert, the Eastern monks who lived in large communities before the adoption of the Basilian Rule, did only as much or as little work as was needed to keep body and soul together; basket-weaving and the like. To St. Benedict, "*Laborare est Orare*"—To labor is to pray. His Rule allows the omission or postponement of the choir office when it is imperative that the monks work in the fields; and for some centuries work, in the sense of the performance of the multifarious tasks that are involved in an agricultural economy—including also road-making and bridge-building—was a dominant note in Western monastic life. Moreover, great monasteries and abbey-churches still exist to give testimony to their accomplishments as builders. Most monks, it must be remembered, were for hundreds of years laymen and not priests; Christian monasticism in its origins and early development was a lay and not a clerical movement; the choir offices which the monks recited in community were services for which no priest was needed. Four hours a day was enough time for the divine office; later, when most monks were priests and time was found for the daily conventual High Mass and for private Masses, the schedule was disarranged. Work became a less and less important feature of monastic life; it was largely to occupy the time of monks who no longer spent a large part of each day at manual labor that the later monastic orders multiplied their religious services and lengthened inordinately the amount of time to be spent in chapel.

The later Merovingian period witnessed an outburst of missionary activity on the part of the monks. Christianity was first preached to the Anglo-Saxons by monks sent from Rome at the close of the 6th century; credit for the conversion of England is divided between Roman (Benedictine) and Celtic monks. On the continent, the monks were extremely

active in the propagation of the faith among the Scandinavians and other Germanic peoples, and were pioneers of civilization in the eastern borderlands. Their contribution toward the development of the arts and crafts of husbandry and of architecture was considerable. When at the height of the Middle Ages trade and commerce were becoming increasingly more important, the older monastic organizations, wedded to the simple agricultural economy of an earlier day, were at a disadvantage as compared with the younger orders, such as the Cistercians, whose possessions were employed in ways more consistent with the demands of the age.

Monasticism underwent changes as the Middle Ages lengthened; partly development, partly decline and disintegration. Between the monastic ideal and the actual practice of monks, there was at times a wide gulf. Successive reforms aimed at tightening up discipline, at reviving an earlier and lost simplicity, at increasing the severity of ascetic practice. The growth of feudalism involved the feudalization of the Church; and the monasteries were drawn into the feudal system. Abbots became great feudal lords, attending royal courts and parliaments, performing all the duties that fell to the lot of the greater feudatories. Some monasteries acquired a great amount of wealth and were numbered among the landed proprietors, with many manors peopled with free and unfree tenants, and the obedientiaries (monastic officials) were occupied with the duties that must be performed by the managers of great estates. The Chronicle of Jocelin de Brakelonde, utilized by Thomas Carlyle in his *Past and Present*, gives a vivid picture of the varied activities of a 13th century abbot, busy with many things. The difference between such an abbot and the abbot portrayed in the Rule of St. Benedict typifies, in some sense, the divergence between the monasticism of the first generations and the monasticism of the height of the Middle Ages. Much of the change was legitimate development, the adaptation of monasticism to the altered social structure; yet, without underestimating the value of the services rendered by the monks to the Church and to civilization in the later, as well as in the earlier, medieval centuries, it is unquestionable that the departure from their original ideals and practices was accompanied by deterioration and decay.

The vast wealth of the monasteries was hardly compatible with the monastic ideal of poverty; and the amount which the religious houses devoted to charitable uses—to feeding the hungry, caring for the sick, and the like—was but a fraction of their total income. The whole series of endeavors by monastic reformers (see CARTHUSIANS, CISTERCIANS, TRAPPISTS) to restore discipline and to increase the austerity of conventual life is good evidence of their fear of laxity and corruption; the attempts of popes and councils to provide effective machinery for the visitation of monasteries and the correction of abuses shows that the Church as a whole recognized that there had been a falling away from the monastic ideals; even better evidence, perhaps, can be found in the obstructions

and evasions with which, too often, the monasteries met these attempts at reform. The darker side must not be over-stressed: departure from the highest of ideals need not—and did not—involve universal and deep-rooted moral corruption.

Two main difficulties in the history of monasticism call for mention. The question of work was one of the greatest problems; when monks ceased to spend a part of every day at hard manual labor, they opened the door to a variety of abuses. While teaching in the monastery schools and copying the Scriptures and the classic authors in the scriptoria were occupations of incalculable value, there were many for whom these could not take the place of the physical labor enjoined by St. Benedict and performed by the early monks. A second difficulty came through the multiplication of religious establishments. Europe was overstocked with monasteries, and men without genuine vocation for a life of disciplined renunciation entered the monastic life. The result at best was a loss in energy and fervor and a decline in ideals; at worst, it meant giving free play to what St. John in his 1st Epistle calls "the lust of the flesh and the lust of the eyes and the pride of life." In a rude and tumultuous age, only in the monastic life could men find that peace which the world cannot give; while there is no evidence to warrant the conclusion that monasticism entirely outlived its usefulness, the institution was so characteristically medieval that the dawn of modern Europe witnessed a sharp decline in the part played by monasticism in the life of the Church. Not alone in the countries that broke away from the papal obedience but in Roman Catholic lands as well the centuries following the Protestant Reformation were marked by a great decrease in the number of religious establishments and of professed monks. The monastic revival of the past century shows, however, that monasticism is still a recognized way of life and an important factor in Catholic Christendom. A. H. S.

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**MONASTIR**, or **BITOLJ**, a city of YUGOSLAVIA, in Macedonia, situated on the banks of the Dragor River at the foot of Mt. Pelister, about 85 mi. by railroad, northwest of Salonika. Monastir has several schools among which is a school of arts and sciences and still has numerous mosques. Manufactures include carpets, rubber, ribbons and silver and filigree work. The plain, which stretches from the edge of the city toward the Tcherina River, offers rich pasturage for cattle, and wheat, maize, tobacco and poppy are extensively cultivated. Monastir is the distributing center for all these products, tobacco, wheat, skins and woollens being the chief articles, and annual fairs are attended by tradesmen from distant cities.

In Turkish days, Monastir was the capital of the vilayet of the same name and, next to Salonika, was the largest and most important city in Macedonia.

During the first Balkan War the Serbians occupied the town in 1912; though claimed by Bulgaria, it was assigned to the Serbs by the treaties of London and Bucharest. During the World War the Bulgarian army bombarded and occupied the city, but at the end of hostilities it was again ceded to Serbia. Owing to the proximity of the Greek boundary, which hinders trade intercourse, Monastir has declined in commercial importance. Pop. 1931, 32,982.

**MONAZITE**, a resinous, yellow to brownish red mineral which varies from transparent to opaque. Complex in composition, it consists of phosphates of the rare elements cerium, lanthanum, thorium, neodymium, erbium, yttrium and praeosdymium, and serves as the ORE of some of them. The primary occurrence of monazite is in granites, gneisses and pegmatites, but the commercial production comes from PLACER deposits, either beach or stream, of monazite, with zircon, garnet, ilmenite and gold. Thorium and cerium oxides are used in making incandescent gas-mantles, and a cerium-iron alloy forms the sparking metal of cigarette lighters. Mesothorium, a by-product of gas-mantle manufacture, is used in luminous paints. Brazil and India are the principal sources of monazite; smaller quantities come from North and South Carolina. *See also* ORE DEPOSITS.

**MONCTON**, a city and port of Westmoreland Co., New Brunswick, Canada, situated at the head of navigation on the Petitcodiac River, 35 mi. southeast of Kingston. Having a good harbor, Moncton carries on an active trade in timber and agricultural products. There also are stove, boiler and engine works and woolen, cotton, flour and feed mills. The shops and general offices of the Canadian National Railway have headquarters in the city. Pop. 1921, 17,488; 1931, 20,689.

**MOND, LUDWIG** (1839-1909), English chemist, was born at Cassel, Germany, on Mar. 7, 1839. After studying at Marburg, then with BUNSEN at Heidelberg, he went to England in 1862, and began to operate an alkali manufacturing plant. At first using the old LEBLANC soda process he devised a method for recovering the sulfur from the waste, but afterwards became the first to introduce the Solvay ammonia soda process into England, manufacturing chlorine as a by-product. He invented a new method of obtaining nickel from its ores, by means of its reaction with carbon monoxide. Apart from his many contributions to scientific and research institutions, he provided the original endowment for the Davy-Faraday Research Institute. He died in London on Dec. 11, 1909.

**MONEL METAL**, an alloy containing about 2/4 parts of nickel to one of copper. It is metallic white in color, resistant to corrosion, and as strong as the lower range alloy steels (65,000 to 150,000 lbs. per sq. in. ultimate strength). It is efficiently rolled and forged and is exceptionally malleable, but working requires high power because of the strength involved. It is extensively used in the United States in service and handling tables for food, ice cream, and beverages; laundry dye, chemical, and food packing ma-

chinery, and in Europe as critical parts of steam power plants and chemical plants. It is widely resistant to acids, alkalis and salts, but is attacked by certain mixtures of acids and oxidizing agents. Exposed to weather it gradually loses its bright metallic luster and becomes brown or greenish brown in color, but almost permanently retains its strength and soundness except in badly polluted industrial atmospheres. *See also* NICKEL.

R. J. McK.

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**MONESSEN**, a city of Westmoreland Co., Pa., 30 mi. south of Pittsburgh on the Monongahela River; it is served by the Pittsburgh and Lake Erie, Pittsburgh and West Virginia and, from across the river, Pennsylvania railroads, by motor busses and by an airport. Primarily industrial, Monessen's manufactures, chiefly steel and its products, had an approximate value in 1929 of \$59,000,000; the same year the retail trade amounted to \$6,852,681. Founded in 1897, Monessen was incorporated in 1898. The name is derived from Monongahela and the steel center of Essen, Germany. Pop. 1920, 18,179; 1930, 20,268; many foreign-born.

**MONET, CLAUDE** (1840-1926), French Impressionist painter, was born in Paris, Nov. 14, 1840. At Havre, where he grew up, he made a reputation with his caricatures. After serving for 2 years with the African *chasseurs*. Monet studied under the classicist, Gleyre, whom he left in 1863 in order to affiliate himself with the group of *plein air* painters. In 1874 he exhibited a picture entitled *Impression of the Setting Sun*, from which the term "impressionist" was derived. Monet's principal preoccupation was with light effects and his attempt to analyze light into its component spectral colors resulted in various series of pictures of the same subject, such as the *Cathedrals*, painted at different times of day or under different light conditions. Monet died at Giverny, Dec. 5, 1926.

**MONETA, ERNEST TEODORO** (1833-1918), Italian journalist and worker for peace, son of a prominent patriot, was born in Milan. Though still a young boy in 1848, he took part in the revolution and became an officer of the general staff under Garibaldi. In 1860 Moneta undertook editorial work on *Libera Parola* in Turin and in 1867 was director of *Il Secolo*, a prominent newspaper. About 1870 he began to devote himself to the cause of peace and in 1906 was made president of the International Peace Congress in Milan. For this and for his work *Le Guerre, le Insurrezioni e la Pace nel Secolo XIX*, he received the Nobel Peace prize. He died Feb. 10, 1918.

**MONETARY UNION**, an association of sovereign states with respect to matters pertaining to their monetary systems, and having as their aim a common monetary system in the countries involved. The principal monetary union has been the Latin monetary union formed in 1865 between France, Switzerland, Italy and Belgium. Greece joined the union in 1868. According to the agreement the coins of all

these countries were to be uniform in size and weight, but might differ as regards design. The unit was worth 19.3 cents in American money. It was agreed that the coins of each country would be accepted in any of the other countries. The union was based upon the bimetallic standard at a ratio of  $15\frac{1}{2}$  to 1. Prior to the union the currency systems of the countries involved had been similar, and coins had circulated across national boundaries. Spain, although not a member of the union, in 1868 adopted the monetary system of the union. In 1878 the members of the Union suspended completely the free coinage of silver (*See FREE SILVER*).

Another monetary union was the Scandinavian monetary union formed between Sweden and Denmark in 1873. Norway became a member of the union in 1875. According to the agreement the gold and silver coins of each of the three countries were **LEGAL TENDER** in all of them. In practice the bank notes of the three central banks were also accepted at par in all the three countries. The union was based upon the gold standard with a unit worth 26.8 cents in American money. J. P. Y.

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**MONEY**, one stratagem or device developed during the evolution of trade. Although it is often assumed that **BARTER** was the first form of trade, this may never actually have existed, for the earliest records give evidence of some medium of exchange. Metallic coins made an early appearance, at first of gold and copper, later of silver and iron. An official seal applied to gold ingots was the first form of **SPECIE** money, which spread through Asia Minor and Greece. Athens improved and standardized its coinage, and Rome set a high standard. The first coins were issued by merchants, then the priests took to themselves the right of coinage, and finally it was appropriated by the king or state. The issue of paper money was begun in Rome, but it lapsed during the later centuries and was revived again in England and France in the 17th century.

Coin is less popular now than formerly as a medium of payment in retail trade, for it is bulky and expensive to transport. **CHECKS** and **PAPER MONEY** have largely taken its place in everyday transactions. Paper money has become relatively more frequent than coin, but is losing ground to checks, and will probably continue so to do.

The function of money is broader than a mere medium of exchange. Money serves also as a standard of deferred payments, insuring that a debtor pays back at the maturity of his loan the same amount of money that he received. Money is also a store of **VALUE**, permitting savings to be made. Its most important function, besides serving as a medium of exchange, is that of measure of value, so that objects of the most diverse character may be evaluated and compared as to their pecuniary worth.

The problem of prices is intimately associated with that of money. The fact that the value of money in

terms of commodities may change, sometimes rapidly, prevents money from perfectly fulfilling the functions enumerated above. If the purchasing power of money falls to one-tenth of its former level, which is a less drastic change than actually occurred in many countries as a result of the World War, the lender who receives back the face value of his loan at maturity in reality is cheated of nine-tenths of his value. The same would apply to the depositor in a **SAVINGS BANK** or a holder of **BONDS**. The phenomenon of rapidly changing value of money has been most evident since the modern development of paper money, for this can be more rapidly changed in amount than metallic coin. The temptation to pay its bills with the printing press is one which governments in war time find it very difficult to resist, and the resulting inflation cuts down the purchasing power of each unit.

The quantity of money required by a nation—the quantity which has satisfactorily met its needs and which is sufficient to keep its price level stable—depends upon many factors. The extent to which deposit credits in the form of bank checks are used instead of coin in making payments; the proportion of wholesale to retail trade; the type of industry, and the proportion of foreign trade to domestic, are some of the most important influences. When any one of these factors is disturbed, the equilibrium is upset and the whole economic structure of **PRODUCTION** and **distribution** may be disturbed before a new equilibrium is obtained.

The concept of money is one of the most important in modern society, for a large part of valuations are expressed in pecuniary terms, and indeed there is no other common measure for many things. Every aspect of life is bound up with the **PRICE SYSTEM**; what a man does, what he produces, and how he spends his **INCOME**, depend upon his judgment of present or future prices. This is more true of the present age than of any other, for in the days when the family or farm produced a large part of the goods needed by the individuals there, many things altogether escaped pecuniary valuation. In the present age of specialization, when one individual ordinarily helps to produce only one good, and all of the goods needed by him must be purchased, it is inevitable that everything is thought of in terms of price. *See also* **STABILIZATION**; **LEGAL TENDER**; **GOLD**; **GOLD STANDARD**; **BANKS AND BANKING**; **CREDIT**.

B. H. B.

**MONEY, QUANTITY THEORY OF.** *See* **QUANTITY THEORY OF MONEY.**

**MONEY ECONOMY.** Writers on **MONEY**, **BANKING** and **BUSINESS CYCLES** usually describe the present economic system as a money economy. They point out that money broadly considered is no mere facilitating agent in effecting exchanges of goods and services, but instead itself affects vitally all phases of the economic system.

In money economy, the essence of business strategy and individual economic activity consists in making and spending money incomes. Money affects produc-

tion and consumption just as much as it affects exchange. The elaborate market organization that it renders possible makes possible large-scale output of a great variety of goods, produced by highly specialized processes for a market rather than to order, with which we are today familiar.

The modern price system implies a monetary or pecuniary organization of society. The business man has developed the science of accountancy (*see* ACCOUNTING), which represents nothing more nor less than the reduction of all economic processes to a common pecuniary basis of reckoning. He strives after pecuniary profits, which represent the margin between monetary costs and monetary selling prices. He considers a technology of business, rather than a technology of industry. The individual on his part faces the problem of apportioning his monetary income among various classes of expenditure—a process more systematically undertaken in the construction of a family budget. His immediate interest lies in sums of money rather than in wants and the satisfaction of those wants.

Equally as important, people today have a pecuniary habit of thought. Money has become a convenient yardstick by means of which to measure goods. This is especially important today, when the individual must needs be incompetent to judge the real merit of the great variety of articles, many of them highly complex in nature, which are produced. Cheapness has become synonymous with ugliness, expensiveness with desirability. Such a process of evaluation is carried over to persons and not confined to things. The mere accumulation of wealth calls for a certain approbation. The question becomes, in the vernacular, not, how did he get it, but, has he got it?

To state these aspects of the modern money economy is to indicate its shortcomings. The perversion of social ideals and the development of a cash register conscience are obvious. The efficiency which the mechanism can develop, and at the same time its delicacy or liability to breakdown, are becoming increasingly recognized by people at large as well as by economists. Much of the discussion of remedies for the business depression existing in 1929-32 centered around the money economy rather than other phases of business conditions and was extremely critical of its workings.

W. H. Sr.

**MONEY LENDING.** Many wage-earners and low salaried persons have need for small personal loans to meet emergencies arising most frequently from illness, death, unemployment or accumulated debts. Demand for such loans has increased in recent years by reason of broad extension of credit to consumers, particularly through installment sales. Since relatively few personal loans can be made by banking institutions established for commercial purposes, several types of specialized financial agencies have arisen to meet legitimate needs. Where decent facilities are not available, small borrowers must turn to loan sharks.

Small loans are usually made on the security of pledges of jewelry or other personal property left with the lender; notes signed jointly by the borrower and two or more accommodation co-makers; chattel mortgages, usually on household furniture or automobiles; and assignments of wages.

The principal agencies making small personal loans and their usual security are unlicensed lenders, or loan sharks, on all types of security, but particularly wage assignments; pawnbrokers, on pledge security; personal finance companies, on chattel mortgages; industrial banks, on co-maker notes; special personal loan departments of banks, on co-maker notes; credit unions, which are cooperative savings and loan societies, on co-maker notes; and remedial loan societies, which are semi-philanthropic agencies, on all types of security.

The usual monthly interest rates are 1% charged by credit unions and the lowest cost bank, 1½ to 2% by most personal loan departments of banks and industrial banking companies, and 2½ to 3½% by pawnbrokers and personal finance companies. Loan shark rates are customarily 15 to 20% monthly.

At the end of 1931, statewide legislation regulated credit unions in 35 states, personal finance companies in 28 states, and industrial banks in 24 states. *See also* FINANCE PAPER. L. HE.

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**MONEY MARKET**, the field of operation of those institutions and occupations specializing in the function of bringing together the supply of short-term and long-term funds for distribution to those types of activity which bid successfully for their use. The term credit market might be a more exact one, but the term money market in this connection is justified by long usage.

The important money markets of the world have always existed in the great centers of trade. Hamburg, Amsterdam and London have held successively the first place as world money markets, but there have been in addition many local money markets, each serving its own area according to local needs. London owed its predominance to the unquestioned value of the pound sterling, which made foreign bills drawn in sterling acceptable all over the world. It was also the only free gold market, where gold could always be obtained at a price. The difficulty of maintaining the gold standard in England during and after the World War brought a marked decline in the prestige of London, and made New York a serious competitor.

The money market of New York has been gradually developing during the past century and a quarter. Some of its institutions are common to all money markets, others are peculiar to that city. There are in the first place the national banks, state banks and trust companies, with their affiliated investment com-



panies, trust departments, savings departments, bond departments, as well as their regular commercial banking business, which stand ready to serve every credit need. In addition to these incorporated institutions which owe their existence to national or state law, there are the unincorporated private banks, existing often as partnerships with unlimited liability, which perform many of the same functions as the incorporated banks but placing greater emphasis on the investment phases of banking. They are among the oldest and most powerful of the banks, and through interlocking directorates are linked with domestic and foreign industrial concerns, railroads, and PUBLIC UTILITIES. Their financial statements are never published, in contrast with those of the incorporated banks which are required to make regular public reports. With the growth of the New York money market, numerous foreign banks have established agencies there.

At the keystone of the arch is the Federal Reserve bank of New York, exercising a predominant influence over the volume of credit outstanding. Although only incorporated domestic banks are members of the system (*see* FEDERAL RESERVE SYSTEM), the credit operations of the Reserve bank, changes in the bank rates and in its open-market policy, affect the whole money market since they make money tight or easy.

The next most important group of institutions are the organized exchanges for the carrying on of transactions in securities and in produce. They include the New York STOCK EXCHANGE, the New York Curb Association (*see* CURB MARKET), the New York Cotton Exchange, the New York Produce Exchange, the New York Coffee and Sugar Exchange, the New York Coco Exchange, and the Rubber Exchange of New York. The conduct of members and of their transactions is carefully regulated and supervised in the interests of the maintenance of high standards of economy, efficiency and honesty.

There are also COMMERCIAL PAPER houses for dealing in the short-term credit represented by PROMISSORY NOTES of merchants with good credit; ACCEPTANCE CORPORATIONS which buy and sell dollar acceptances. Stock and bond brokers, produce brokers, note brokers, money brokers, bill brokers, foreign exchange brokers, insurance brokers and other forms of brokers and commission merchants form intermediaries between the different parts which make up the market.

The financial machinery just described serves as an intermediary for bringing together bids and offers of loanable funds. Bids for funds are made in New York to finance stages of agricultural production, stages of manufacturing, movements of goods, storage of goods, capital improvements and new enterprises and stock market operations. The principal sources of funds are 1. The surplus funds of banking institutions; 2. Funds on hand pending decision as to their permanent investment or expenditure; 3. Reserve funds of industrial corporations, insurance

companies and others, and 4. Savings, both private and corporate.

Each one of these bids and offers of funds takes the form of some kind of credit instrument, short-term or long-term as the case may be. Each type of instrument has its own submarket, so that one speaks of the CALL LOAN market, the COMMERCIAL PAPER market, the DISCOUNT market, the BOND market, the STOCK market, the market for federal funds, and so forth. Yet fundamentally all these are merely parts of one money market, and funds flow from one part to another as the demand changes.

The call loan market and the commercial paper market are peculiar to New York, and arose out of distinctive American conditions which have not been duplicated elsewhere. The London market has no demand loan on Stock Exchange collateral comparable to the New York call loan.

There has always been a certain amount of movement of funds from one money market to another within the country, and to a certain extent between countries. Increasing facility of communication has increased such movements, just as it has increased movements of commodities, and this process will continue, materially reducing differences in interest rates and distributing more evenly the supply of loanable funds over the world. The principal centers for the financing of foreign trade will probably continue to be London and New York, but Paris may be expected to offer effective competition in this field. *See also* CENTRAL BANKS; REDISCOUNTING; BOURSE; WALL STREET.

B. H. B.

**MONEYWORT** (*Lysimachia Nummularia*), a small, creeping, perennial herb of the primrose family, called also creeping Jenny. It is a native of Europe often grown for ground cover and as a basket plant, and is widely naturalized in moist places in the eastern United States. The slender stems, sometimes 2 ft. long, bear opposite orbicular leaves and bright yellow flowers, an inch across, produced singly in the leaf axils.

**MONGOL**, a language of the TURCO-MONGOL-TUNGUS linguistic family spoken by some 4,000,000 people in the Republic of Mongolia (Outer Mongolia, north of Gobi), in Inner Mongolia (south of Gobi), in Barga (west of Manchuria), in Siberia (west and east of Lake Baikal), and in various colonies (Lower Volga, Northern Caucasus, Northern Afghanistan, Northern Tibet). There are two dialectic groups: western (Oyrat, Kalmuk) and eastern.

Mongol is less consistent than TURKISH. As regards VOWEL-HARMONY, a single ordinary *i* may be used both in hard and soft stems; and long vowels result from frequent absorption of intervocalic gutturals. The case-suffixes have several varieties, and the plural is formed not by pure AGGLUTINATION, but often by changing the termination of the singular, as *balgasun*, "town," *balgat*, "towns." Mongolian words are usually longer than Turkish, as *oljigen*, "donkey" = Turkish *eshék*, and therefore look more archaic, although both Mongol phonetics and gram-

mar are more broken down than Turkish. Under Buddhist influence, the language contains many borrowed words, chiefly from Indian. V. M.

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**MONGOL EMPIRE**, the widespread empire established by the Mongol leaders in the 12th, 13th and 14th centuries. The Mongols, a nomadic people, have inhabited for many centuries the area in Asia now called Mongolia. They made incursions into China at various times, bringing greater or less territory under their control. The Chinese Wall was built shortly before the beginning of the Christian era, chiefly to protect the country against these raids. Climatic changes in northeastern Asia were partly responsible for the movement of the Mongol peoples into the neighboring areas, the drying up of the country making it impossible for them to maintain their pastoral and nomadic life. In the 12th century there began a process of consolidation of the various Mongol tribes which came to a head under the leadership of Genghis Khan, who extended the power of Mongol authority far down into China, and westward well into Russia. His grandson, KUBLA KHAN, continued the expansion of the Mongol authority, and at the height of his power, towards the end of the 13th century, he ruled an area which reached from the eastern shores of Asia westward to the Baltic and from the Arctic Circle to the northern border of India—a greater empire in territory and number of subjects than has been ruled by any other monarch. The Mongol expansion was carried out by the use of extraordinarily able and swiftly moving armies of horsemen who were absolutely ruthless in their destruction of life and property in the areas into which they moved.

The great period of the Mongol Empire lasted from 1214, when Genghis Kahn overran the northern half of China, to 1294, when Kublai Khan died. Kublai Khan had made his capital at Peking, and had been a great patron of literature and the arts. He also employed various Europeans, among them MARCO POLO, in his administration. After Kublai's death the unwieldy empire began to crumble, and within a hundred years it had completely disintegrated.

While the Mongol conquests were cruel, the Great Khan's Peace which their rulers enforced for generations in Central and Eastern Asia was a great stimulant to European commerce. Black Sea trade particularly grew, to the benefit of Genoa since she held a more favored position than Venice with the restored Greek Empire at Constantinople. The Muskovite dukes expelled the Tatars from Russia in the 15th century. Their other western possessions fell to the Ottoman Turks.

**MONGOLIA**, an ill defined area lying to the northwest of China, the home of the Mongol peoples. The region stretches roughly from Siberia on the north to the Great Wall of China on the south,

and from the western borders of Manchuria to Russian Turkestan on the west, and occupies between 1,800,000 and 2,000,000 sq. mi. This general area for many centuries has been the home of nomadic tribesmen who at various times have pushed out into neighboring territories and established military empires. The largest and best known of these was the MONGOL EMPIRE which dominated Asia and part of Europe in the 13th century. During the past hundred years there has been a steady expansion of Chinese population and influence into Mongolia from the south. The southern half of Mongolia, formerly called Inner Mongolia, was ruled as four special administrative areas in the later years of the Manchu Dynasty. These special areas were transformed into provinces of the Chinese Republic in 1928. The western portion of the remaining part of what was called Outer Mongolia was made into a semi-independent soviet republic, the Soviet Mongolian Republic, under Russian influence in 1924. Prior to these changes, Chinese suzerainty was recognized over the whole of Mongolia, but the actual Chinese authority was small in controlling the Mongol tribesmen, and there were a number of revolts against the Chinese rule.

A substantial part of central Mongolia is occupied by the GOBI DESERT, and desert areas stretch south and west toward Chinese Turkestan. Outside of these desert areas Mongolia is capable of agricultural development, and it is into these regions that the Chinese farming settlers have moved.

Chinese trade across Mongolia to the central city of URGU formerly was carried by camel caravans. In recent years motor transportation has been established. This trade reached considerable proportions and was very profitable for the Chinese. Since the establishment of the Soviet Mongolian Republic Chinese trade has been stopped almost entirely, and the trade of Western Mongolia has passed to the north, to Russia. The Mongol tribesmen depend for their livelihood almost entirely on their sheep, horses and camels. The number of animals in the nomadic herds was estimated in 1928 as 1,304,000 horses, 220,000 camels and 10,600,000 sheep. Industry is very little developed in Mongolia, and little has been done to tap the mineral resources. These include, as far as now is known, fairly large amounts of copper, silver, coal, gold and tin. The export trade is chiefly in furs and skins of various kinds.

A corrupt form of Buddhism called Lamaism has secured a very strong hold on the Mongol peoples, and nearly a third of all adult men are in the Lama priesthood.

The population of the whole of the Mongolian area is approximately 5,000,000, of whom about 3,500,000 live in the areas which are now Chinese provinces. The population of the Mongol Soviet Republic area is approximately 675,000, of whom 575,000 are Mongols and 90,000 are Russians.

**MONGOLIAN RACE.** See RACES OF MANKIND: *Mongoloid Group*.

**MONGOOSE** (*Herpestes birmanicus*), a weasel-like mammal, native to India, called also the ichneumon. The body is about 18 in. long and the tapering tail about 14; the long fur is grizzly red-gray. The mongoose is kept in houses in India and kills rats,



MONGOOSE

lizards and snakes, especially the cobra. The mongoose is not immune to poison but escapes partly by speed and partly by the protection of thick hair on its neck. Usually it tempts the snake to strike until exhausted, when the mongoose breaks its neck. In 1872 some of these animals were introduced into Jamaica to end a plague of rats, but they also nearly exterminated all ground mammals, birds and snakes. Other species are also found in southern Asia, throughout Africa and in southern Spain.

**MONGREL**, the result of mating two or more different breeds, producing progeny without the clear-cut characteristics of any. Used largely of domestic animals, especially dogs, the term is applied also in horticulture to plants of mixed origin or badly balanced crossing. The verb mongrelize, adopted into general usage, signifies the debasing or vulgarizing of language, art or anything to which it is applied.

**MONISM**, a philosophical theory aiming at the reduction of reality to some single principle. Both **IDEALISM** and **MATERIALISM** are monistic philosophies. In the one case matter is reduced to mind, and in the other mind to matter. Monism may be either qualitative or quantitative, or both. Leibnizian monadology is qualitatively monistic but quantitatively pluralistic, i.e., it reduces reality to a single quality, all monads being spiritual (inextended) in character, but it makes no attempt to reduce their number to one. **BARUCH SPINOZA**'s substance was one in quantity but had the two attributes of thought and extension, thus being dualistic qualitatively. From the standpoint of speculation, it has been regarded as the ideal of thought to be able to attain a complete monism, one that could eliminate all distinctions and harmonize all differences in an ultimate One.

**MONITOR**, a name applied to lizards of the genus *Varanus*. These formidable creatures, found in Africa and southern Asia, the East Indies, Philippine and Pacific Islands, are characterized by their large size, bead-like scales, well-developed limbs and tail, and long, forked tongue. One East Indian species, *V. komodoensis*, attains a length of 10 ft. or more and is the largest lizard alive to-day. In spite of their

size, monitors are not dangerous to man. They are oviparous and carnivorous, subsisting on a great variety of small animals, vertebrates as well as invertebrates. Monitors often prefer the vicinity of water, some of them being excellent swimmers. Others climb with ease. The most familiar form (*V. niloticus*) is distributed over all of Africa but the northwestern



AFRICAN MONITOR

part and has the habit of laying its eggs in termite nests. *V. salvator* is well-known in the East from India to the Philippines.

**MONITOR** and **MERRIMAC**, famous ironclad vessels of the **CIVIL WAR**, which met at Hampton Roads, Va., Mar. 9, 1862. The *Merrimac* was a reconstructed vessel, fitted at the Confederate naval works, Richmond, with a cast-iron prow and the hull roofed with iron; 10 heavy guns comprised its armament. The *Monitor*, constructed from plans by John Ericsson, of New York, was a much smaller ship, presenting a thin edge of surface above the water line, and fitted with a revolving iron turret containing two guns. On Mar. 8, 1862, the *Merrimac*, braving the shore batteries of Newport News, sank two Union vessels. The next morning, as the *Merrimac* advanced against other Union vessels, the *Monitor*, commanded by Lieut. John L. Worden, appeared and gave battle. After a three hours' duel the *Merrimac* retired. The engagement was of far-reaching importance as a dramatic beginning of the transition from wooden to iron and steel ships.

**MONITORIAL SYSTEM**, a term given a system of instruction which uses advanced students, called monitors, to teach younger students. The idea was never developed to any extent in America but was popular in England in the 19th century. The system has been called also the Bell System and the **LANCASTERIAN MOVEMENT**, as it was worked out by Dr. Andrew Bell and Joseph Lancaster at practically the same time, though independently.

**MONITORING RECEIVER**, a special name applied to any type of **RADIO RECEIVER** used to pick up the signals of a transmitter (see **RADIO TRANSMITTER**) to check the performance of the transmitter.

**MONK, MARIA** (c. 1817-1850), a celebrated woman impostor, was born in Canada about 1817. In 1835 she circulated a lurid story in New York City that she had fled from the nunnery of the Hôtel Dieu at Montreal to escape the abominations ostensibly practised in the institution. Her story, published under the title, *Awful Disclosures of Maria Monk*, 1836, was said to have sold 200,000 copies. The same

year William L. Stone of the New York *Commercial Advertiser* visited Montreal and obtained facts proving her allegations false and so ending the anti-Catholic feeling which her assertions had created in sections of the United States and Canada. She died in 1850.

**MONK**, originally a Christian anchorite who retired from the normal activities of life and devoted himself to religious contemplation. This element of solitariness appears to have been in the Anglo-Saxon *Munuc* and the Greek *Monos*, from which the word is derived. Later, a monk was a member of a religious order or community, living under solemnly imposed vows, such as poverty, chastity and obedience. The exact original meaning of the word is obscure. St. Augustine saw in it the spirit of unity, "men of one heart and soul," while St. Jerome thought that it signified a spirit of aloofness from the world. The usage is probably due to the Rule of St. Benedict which constantly describes the brothers as *monachi* and their house as a *monasterium*. The word "monk" is not commonly used in the official language of the church, and is a popular rather than a scientific designation. It is now applied also to the anchorites of Buddhism and Islam.

**MONKEY**, a member of a group in the order Primates, sharply distinct from the inferior lemurs, but closely connected by the baboons to the higher anthropoid apes. In general monkeys are of moderate size, ranging from tiny marmosets to the big dog-like baboons. They have long tails, ornamental hair-growths, and often brightly colored coats, live in forest trees, where they exhibit great agility, and feed



COURTESY N. Y. ZOOLOGICAL SOCIETY

HOWLER MONKEY

on fruit, leaves, eggs, young birds and insects; and produce one or two offspring annually. Monkeys inhabit the tropical and subtropical zones of all continents except Australia. Various species are restricted, however, to comparatively limited districts. Many monkeys exhibit much intelligence, though frequently inclined to mischief.

Monkeys fall into two groups, those belonging to the Old World and those found in America. There are two characteristic distinctions between these groups. The Old World monkeys have narrow noses,

with the nostrils close together, and are called Catarrhine; none has a prehensile tail. The American monkeys have flat noses, with the nostrils widely separated, and are called Platyrrhine; moreover, their tails are prehensile. Monkeys form three families, namely: *Callitrichidae*, American marmosets and tamarins; *Cebidae*, all other American monkeys; and *Cercopithecidae*, Old-World macaques, guenons, baboons and langurs. The anthropoid apes of the Old World, often loosely called monkeys, comprise two families: *Hylobatidae*, the gibbons; and *Pongidae*, the chimpanzees, gorillas, and the orang-utan. These five families embracing all the mammals indiscriminately called monkeys contain about 200 species. The intelligence and varying psychology of these animals, the highest members of the animal kingdom, have been diligently studied. Their habits and cries have led to superstitious veneration and quaint folklore among primitive peoples.

E. I.

**MONKEY FLOWER**, the common name for a numerous genus (*Mimulus*) of herbs and small shrubs of the figwort family so called because of the gaping, two-lipped flowers, somewhat resembling the grin-



FROM JEPSON. MAN. FL. PLANTS CALIF. COPYRIGHT

COMMON MONKEY FLOWER

(*Mimulus guttatus*). Flowering branchlet and leaves

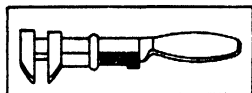
ning face of a monkey. Various species with showy yellow or salmon-red flowers are grown in gardens. See also *MIMULUS*.

**MONKEY-POT** (*Lecythis ollaria*), a large tree of the lecythis family native to Brazil. It bears a large woody, urn-shaped, capsular fruit, known as monkey-pots, provided with a circular lid and containing numerous hard-shelled seeds. Baited with sugar, the fruit capsule is said to be used to catch monkeys,

which, having inserted a hand inside the "pot" cannot withdraw it. The edible though bitterish seeds are sometimes called sapucaia nuts. *See also* BRAZIL-NUT; SAPUCAIA NUT.

**MONKEY-PUZZLE** (*Araucaria araucana*), a large evergreen tree of the pine family native to Chile and widely planted for ornament in mild climates. It grows sometimes 100 ft. high, with spreading, upwardly curved, interlacing branches, broad, short-pointed, imbricated leaves, huge cones and edible seeds. *See also* ARAUCARIA.

**MONKEY WRENCH**, a tool for turning, or setting, nuts and bolts, having two jaws that are adjusted to different-sized openings by means of a screw. The origin of the name is not certain but is generally considered as being the name of the inventor, Monckey. More properly it is called a screw wrench. *See also* WRENCHES.



MONKEY WRENCH

**MON-KHMER**, a LINGUISTIC FAMILY of Indo-Chinese languages so named from its two chief members, Mon, spoken by the Mon of Siam, and the Talaing or Peguan of Burma and Khmer, the language of Cambodia. Formerly they occupied a much wider area, but Mon has yielded place to BURMESE, and Khmer to SIAMESE and Laotian. They alone have an alphabet (of South-Indian origin) and a literature, the other languages of the group being spoken by wild tribes in the mountains of Annam (Stieng Bahnar, etc.), or scattered between Tonkin and Upper Burma (Palaung, etc.) and as far as Assam (Khassi). The Semang and Sakai of the Malacca Peninsula, as well as Cham, spoken in south Annam, and Nicobarese, have also been regarded as akin to Mon-Khmer, although they are suffixal languages. Words in Mon-Khmer are monosyllabic and without tone, grammatical function being indicated by word-order and particles. There are, however, survivals of affixation and infixion, so that, e.g., a labial prefix still forms a causative (Mon *ket*, "turn around," *phet*, "make turn around"), and a nasal infix an agential noun (Mon *klut*, "steal," *kamlut*, "thief"). The attempt has been made to combine Mon-Khmer with MUNDA, and even with ANNAMESE and Siamese into a single AUSTRO-ASIATIC group, though no cogent evidence for this connection seems yet to have been given. J. B.

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**"MONK" LEWIS.** *See* LEWIS, MATTHEW GREGORY.

**MONKSHOOD**, the common name for a numerous genus (*Aconitum*) of poisonous plants of the crowfoot family, many of which are grown as ornamentals or are the source of powerful drugs. *See* ACONITE.

**MONMOUTH, JAMES SCOTT, DUKE OF** (1649-85), English insurrectionist, was born Apr. 9, 1649, at Rotterdam. His mother was Lucy Walters and he was recognized by Charles II as his son. He

was created Duke of Monmouth in 1663, was made captain general of the king's forces in 1670, and became a political power as the "Protestant Duke." He led the English troops who aided the French against the Dutch and the army which defeated the Scottish Covenanters. In 1679 he went to Holland and allied himself with the Nonconformists. On his return to London he was hailed by many as the successor to the throne. Forced to leave England in 1684 he resided in Holland until the death of Charles later in the year. He assumed the title of James II, returned to England and led an insurrection against the government. Defeated on July 6 at Sedgemoor, Monmouth was captured, brought to London, and beheaded July 15, 1685.

**MONMOUTH**, a city in western Illinois in Warren Co., situated 56 mi. south of Rock Island and served by three railroads. It is a shipping point for large numbers of fine hogs and many head of cattle. The city has large potteries, and cigar factories, tool shops and a plow factory. It is the seat of Monmouth College. Settled in 1824, Monmouth was chartered in 1852. Pop. 1920, 8,116; 1930, 8,666.

**MONMOUTH, BATTLE OF**, June 28, 1778, an engagement of the REVOLUTIONARY WAR which resulted in an American victory. When the British army, on June 18, evacuated Philadelphia and began the march to New York, Gen. Washington gave pursuit, and on June 27 encountered the British force of 11,000 under Gen. Clinton near Monmouth Court House, N.J. Washington with 15,000 Continental troops had the numerical advantage. He detached Gen. CHARLES LEE and 6,000 men with orders to attack the British left wing under Cornwallis. On the morning of June 28 Lee began the attack, with every prospect of success, but inexplicably ordered a retreat. Washington, summoned immediately by Lee's second in command, LAFAYETTE, attempted to retrieve the disaster, and by nightfall had succeeded in forcing the British back to their original position. During the night Clinton withdrew, leaving the Americans in possession of the field. The British casualties were about 450; the American loss, about 300.

**MONMOUTH COLLEGE**, at Monmouth, Ill., a coeducational institution under the control of the United Presbyterian Church. Founded as an academy in 1853, it became a college in 1856. It had productive funds in 1931 totaling \$1,381,776. The library contained 45,000 volumes. In 1931-32 there were 570 students and a faculty of 43, headed by Pres. Thomas Hanna McMichael.

**MONMOUTH REBELLION, THE**, against James II of England was an unsuccessful attempt by James Scott, Duke of Monmouth, to capitalize the Protestant hostility towards James and make himself king. Monmouth, a presumed natural son of James's brother, Charles II, had long attempted to obtain either his succession upon James's death, or actually to depose the King; but his illegitimate birth was an insuperable barrier. Banished to Holland he con-

tinued his intrigues and in May 1685 sent Argyll to Scotland and himself proceeded to the west of England. Argyll failed totally in Scotland. Monmouth's march on Bristol was soon checked and he was captured in Hampshire July 8 and beheaded July 15.

**MONOCACY**, a national monument near Sharpsburg, Maryland, commemorating the Civil War battle of Monocacy fought in the vicinity July 4-5, 1864. The monument, which has an area of one acre, was established Mar. 1, 1929 under the administration of the War Department. It is reached by the Norfolk and Western Railroad.

**MONOCEROS** (gen. *Monocerotis*), the unicorn, a rather large constellation devoid of bright stars and wedged in between Orion, Canis Major and Canis Minor. See STAR: map.

**MONOCLINIC SYSTEM**, in CRYSTALLOGRAPHY, a system in which minerals are said to crystallize when their faces can conveniently be described by referring them to three imaginary axes of unequal length, intersecting at the center of the crystal. One of these axes is inclined to the plane of the other two, which intersect at right angles.

**MONOCOTYLEDONS**, a large class of flowering plants that have parallel-veined leaves, germinate with a single seed-leaf and have the parts of their flowers in three or multiples of it. In the few tree-like groups, such as the palms, yuccas and screw-pines, there is no differentiation of heart wood and sapwood, as in the dicotyledons. Such tree-like trunks have a pith-like interior and a hard, often scaly, outer rind instead of bark.

Most monocotyledons other than palms and pandanas are herbs, the outstanding families of which are the GRASSES, SEDGES, lilies, AMARYLLIS, IRIS and ORCHIDS. Almost universally they lack marginal teeth on their leaves. See DICOTYLEDONS; LILY. N. T.

**MONODY**, meaning literally "single ode" or "single song," a form of music which arose in Italy about 1600, and was the simple forerunner of all harmonic music, being a song with instrumental accompaniment. Before that time, and even during the following century, most music was either in unison or octaves or else was polyphonic in nature, and the support of a melody with harmony was not practised generally. A growing demand for harmony made itself felt definitely about the beginning of the 17th century. To satisfy this, composers first created a simple accompaniment and presently a more complex harmonic structure that reached maturity in the opera and oratorio and, when the instrumental accompaniment became still more ambitious, the SUITE, SONATA, and SYMPHONY.

**MONOGRAM**, a design made of several letters interlaced, commonly used as a personal mark or identification. The monogram has a long history, having been used by Greek and Roman rulers on their coins, by Byzantine emperors and Frankish kings in lieu of signature, by medieval merchants to mark their goods and by artisans and artists to sign their handiwork.

**MONOMETALLISM**, a system of coinage in which one metal is used as the standard for mintage and LEGAL TENDER. With the increased production of gold in the middle of the 19th century BIMETALLISM was almost universally adopted. After a period of more or less unsatisfactory experience with bimetalism, monometallism was again adopted, with GOLD as the standard. Germany adopted the gold standard in 1871; the United States in 1873; France, Belgium, Greece, Italy and Switzerland in 1877.

**MONONGAHELA CITY**, in Washington Co., Pa., 20 mi. south of Pittsburgh on the Monongahela River; it is served by two railways, by motor-buses and an emergency airport. Coal-mining is its chief industry; gas is produced, and there are paper mills, foundries, and other industries. The city was founded by Joseph Parkinson in 1769. He named it Williamsport, but it was familiarly called Parkinson's Ferry. It was incorporated in 1873. The Whisky Insurrection convention met here in 1794. Pop. 1920, 8,688; 1930, 8,675; 15% were foreign-born, 10% colored.

**MONONGAHELA RIVER**, a tributary of the Ohio, formed by the union of the West Fork and Tygarts Valley rivers near Fairmont, W. Va. The West Fork rises near the western border of Upshur Co., West Virginia, and Tygarts Valley in Randolph Co., West Virginia. The trunk stream flows northward into Pennsylvania over a course of 128 mi. and unites with the Allegheny at Pittsburgh to form the Ohio. Its chief tributary is the Youghiogheny which joins it at McKeesport. The area drained, estimated at 7,390 sq. mi., is a fertile country in which there are extensive bituminous coal deposits. The current of the Monongahela is rapid and its channel contains many bars and snaps obstructing year-round navigation. To overcome this a series of dams and locks, which provide slack water navigation from Pittsburgh to Fairmont, have been built. Near the river's mouth is the site of Braddock's defeat during the French and Indian War in 1755.

**MONOPHYSITES**, a name given to those who hold that there was but one composite nature in Christ. During the 5th and 6th centuries, this doctrine prevailed among a large number of Christians. It arose as a reaction against the Chalcedonian decree, 451, which maintained that there existed two unconfused natures, divine and human, in Christ. The Monophysites opposed this decision, which appeared to them but another form of the Nestorian doctrine of Christ's dual personality. One party of Monophysites, led by Eutyches, maintained that, in the incarnation of Christ, the union of the divine and human natures resulted in the extinction of the latter. Another party, of which Severus was the most prominent representative, held that both the human and divine were combined in one single nature. The doctrine of Monophysitism still exists among the Copts and the Syrian Jacobites.

**MONOPOLY**, such control over the supply of a given commodity that it may fix effectively the price

of the commodity. A monopoly may operate in one of two ways: first, it may set the total amount of a commodity to be produced and sell that quantity for what it will bring in the MARKET, or second, it may establish a definite price for its product and produce as large a quantity as the market will absorb at that price. It usually seeks to determine that price for its product which, multiplied by the quantity which it can dispose of at that price, will, when costs are paid, result in the greatest net profit to the monopoly.

Absolute monopoly can exist only when the entire supply of a commodity is controlled. Otherwise any attempt to charge more than the normal price would result in inducing other producers to enter the field and to increase the supply of the commodity in question. Where only partial monopoly exists price control cannot be perfect and can be maintained only within narrow limits.

The granting of the exclusive privilege of manufacturing or trading in certain commodities in Great Britain has at times in the past been considered a prerogative of the Crown. These monopolies were extremely remunerative. Their dispensation was a source of considerable revenue and power to the Crown. Remnants of this practice, though considerably modified, still obtain where governments have established monopolies in such products as matches and tobacco to provide them with revenue. Governments grant monopolistic privileges through PATENTS and TRADEMARKS as an encouragement to invention and authorship. Although such monopolies enable the owners to charge higher prices than would otherwise prevail, it is generally held that this is justified on the ground that it is a reward to creative genius and stimulates the extension of knowledge and control over nature.

Other monopolies are also granted by the government in the form of exclusive franchises. Public utilities are monopolies in this class. Here, however, the monopoly control over prices is limited by government regulation. The social justification for granting monopolies of this sort is that it avoids waste in the duplication of capital equipment and unnecessary expense.

Conspiracy of persons to control the purchase, sale, manufacture or use of a thing contrary to the public interest, is usually prohibited by law. The Sherman and the Clayton acts in the United States were passed to protect the public from illegal combinations seeking monopolistic powers to restrain competition and control prices. See also TRUSTS.

D. H. D.

**MONOTHELITES**, a party within the Christian Church, which held that there was in Christ but one will, the divine. Their doctrine, which arose in the 7th century, owed its origin to the efforts to heal the Monophysite schism. (See MONOPHYSITES.) The Monothelites agreed with the orthodox belief in the existence of two natures in Christ, but denied that the two natures involved two wills. For half a century this controversy divided the Eastern Church. It was brought to a close when the Sixth General Coun-

cil, held at Constantinople in 681, condemned as heretics Sergius and several other Greek bishops who supported the Monothelite doctrine.

**MONOTYPE**, a machine for casting both actual type and justified lines. The machine is in two independent units, keyboard and caster. The keyboard operator, by depressing keys as on a typewriter, causes the machine to make perforated combinations in a roll of paper which is fed over a sprocket by perforations previously provided in the margin of the paper. The record thus produced controls the automatic caster.

The caster mould is adjustable to various widths for thick and thin characters. Automatic action of the machine causes the mould to be adjusted to the appropriate "set" opening for each character. A steel, box-like case holds one matrix of each character provided, arranged in horizontal and perpendicular rows. Automatic control causes this case to move both laterally and longitudinally, bringing desired matrices in turn in centered position above the mould and tightly locked upon it. The pump draws metal from the heated pot, forcing it through an opening in the bottom of the mould. Water circulating through the mould jacket cools the cast, and a knife advances to trim the feet of the type. The mould opens, and the type is ejected into the assembling line, which, when complete, is conveyed to the galley.

Justification is controlled by the keyboard operator. As the line is composed, he strikes a key which puts spaces between words. When the capacity of the line has been reached, he reads an automatic scale which measures the line being set. The scale divides the remaining distance of the line by the number of spaces in the line, indicating the value that must be given each space to justify the line, and the operator strikes a key which records this value on the paper roll or ribbon. The record ribbon passes through the caster in reverse direction, so that the first consideration in each line is the combination of perforations fixing the value of the spaces for that line.

E. W. P.

**MONROE, JAMES** (1758-1831), fifth President of the United States, was born in Westmoreland Co., Va., Apr. 28, 1758. His father, Spence Monroe, was a planter of Scotch ancestry, a descendant of Hector Monroe, an officer in the army of Charles I; his mother, Eliza Jones Monroe, was of Welsh descent, a sister of Judge Joseph Jones, a Virginia delegate to the Continental Congress. Monroe attended the neighborhood school until he was 16, when he entered William and Mary College. The Revolutionary War broke out in his second year and he abandoned his studies to volunteer. He was commissioned lieutenant in the third Virginia Regiment in 1776, and took part in the battles at Harlem Heights, White Plains, and Trenton. Monroe distinguished himself in the last-named action, in which he received a wound in the shoulder. During 1777-78 he served as aide to Lord Sterling, and participated in the actions of Brandywine, Germantown and Monmouth. He held the rank of lieutenant-colonel when his failure to raise a volunteer regiment in Virginia decided him to leave

the army. In 1780, at the age of 22, Monroe began, upon the recommendation of Thomas Jefferson, Governor of Virginia, to study law. This was the beginning of a life-long friendship between the two men.

After concluding his law studies in two years, Monroe sought public office, and in 1782 was elected to the Virginia Legislature, and appointed to the Executive Council. In 1783-86 he served in the Continental Congress, where to strengthen Federal authority he strove to bestow upon the national government the right to regulate commerce. Monroe also led in the demand for free navigation on the Mississippi, and to inform Congress of conditions in the west, he twice crossed the Alleghenies to gather information at first hand. At the end of his term he retired to Fredericksburg, Va., intending to establish a private law practice. He married Elizabeth Kortwright (1768-1830) in 1786. The next year he was returned to the State Legislature, and in the year following was sent to the Virginia convention summoned to ratify the new Federal Constitution. In 1790 the Virginia Legislature appointed Monroe to fill the vacancy in the United States Senate created by the death of William Grayson. In the next four years Monroe vigorously opposed the majority of Federalist projects sponsored by Washington's administration. Nevertheless Washington, recognizing the Virginia senator's ability, appointed him in 1794 as Minister to France, toward which country Monroe was avowedly sympathetic. While at Paris he was warmly received and liked for his republicanism. His failure to lessen French resentment against the United States, and specifically against the JAY TREATY, caused the administration to recall him in 1796. Monroe returned home and in justification of his ministership published a 500-page volume, *A View of the Conduct of the Executive in the Foreign Affairs of the United States in Connection With the Mission to the French Republic During the Years 1794-96*. The work aroused bitter political controversy and Washington never forgave Monroe for the attack. In 1799 Monroe was elected Governor of Virginia, remaining in that office until 1803, when President Jefferson sent him again to France as Minister Plenipotentiary to aid Robert R. Livingston, resident Minister, in obtaining the territory at the mouth of the Mississippi. Monroe exceeded his instructions and negotiated the purchase of the entire Louisiana province (see LOUISIANA PURCHASE). Monroe then went to Madrid, where he strove unsuccessfully to acquire the Floridas, and finally to London where he negotiated a treaty in 1806 which Jefferson never submitted to the Senate because it would have failed to end British seizure of American vessels. Monroe returned to the United States in 1807 and three years later was elected a third time to the Virginia Legislature. In 1811 he was reelected governor, but resigned the same year to become Secretary of State under President Madison. In 1814, after the British raid upon Washington, he became acting Secretary of War. Two years later

Monroe was elected President, receiving 183 electoral votes, against 34 for Rufus King, the Federalist candidate. He took office in Mar., 1817.

Monroe rode the wave of national enthusiasm which rolled over the nation after the War of 1812 and his administrations have been called "the era of good feeling." Except locally the Federalist Party had disappeared, and there remained but one national party, the Republicans. In 1820 Monroe received all the electoral votes but one which was cast for another because of the sentimental desire to have Washington the only president unanimously elected. Despite the "good feeling" many sharp controversies occurred during his two terms. Monroe believed in the benefit of internal improvements, but expressed doubts as to their constitutionality, and his scruples deferred such projects until the advent of his successor, John Quincy Adams. The Seminole War, 1817-18, led to an invasion of Spanish Florida by Andrew Jackson with ensuing international complications. Monroe insisted that he had not authorized Jackson to cross the border, although the latter said that his orders indirectly provided for such a step. The result of the whole affair was a treaty with Spain in 1819, whereby Florida was ceded to the United States in return for the assumption by the United States of claims approximating \$5,000,000. The United States by this treaty abandoned its claims to Texas, for which Monroe was much criticized. Monroe signed the Missouri Compromise Bill of 1820. A Russian ukase of 1821 claiming the Pacific coast as far south as the 50th parallel and European gestures towards a subjugation of Latin American countries which had recently gained their independence led Monroe at the suggestion of John Quincy Adams, his Secretary of State, to incorporate into his annual message of 1823, principles which have come to be known as the MONROE DOCTRINE, viz., the Americas were no longer a sphere for European colonization; armed interference with countries which had obtained and maintained their independence would be regarded as an act of hostility to the United States and lastly, there were to be "two spheres" of influence, European and American, in the former the United States would abstain from interference and from the latter Europe should hold herself aloof. The Doctrine was merely an expression of opinion by the President and was not formally endorsed by Congress, but its principles, under various interpretations, have subsequently assumed international importance.

After his second term, Monroe retired to his estate at Oak Hill, in Loudoun Co., Va., and in his last years he suffered financial difficulties. He died at New York City, July 4, 1831. In 1858 his remains were transferred from the Marble Cemetery, New York City, to Hollywood Cemetery, Richmond, Va. Monroe was the father of two daughters. He was an Episcopalian.

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**MONROE, PAUL** (1869- ), American educator was born at North Madison, Ind., June 7, 1869. He graduated from Franklin College in 1890, took his Ph.D. at the University of Chicago in 1897, and studied at the University of Heidelberg in 1901. In 1899 Monroe was appointed professor of history of education at Teachers College, Columbia University, in 1915 director of the School of Education and in 1923 director of the International Institute. Through his textbooks on the history of education and particularly his *Cyclopedia of Education*, 1910-13, he has won an international reputation. He was appointed by the United States War Department as commissioner to report on the Philippine school system 1912-13, was educational expert for the Chinese Government educational authorities 1921-22 and for Poland 1923. He was director of the Survey of the Educational System of Philippines 1925 and for Porto Rico in 1926, and director of the Educational Survey of Iraq. The latter year he was elected president of the World Federation of Education Associations. Among his writings are *Source Book in the History of Education for the Greek and Roman Period*, 1901; *A Text-Book in the History of Education*, 1905; *Principles of Secondary Education*, 1914; and *China: A Nation in Evolution*, 1927. Monroe was the editor of the department of education for *The National Encyclopedia*, 1932.

**MONROE**, a city in northern Louisiana, the parish seat of Ouachita Parish, situated on the Ouachita River, 96 mi. east of Shreveport. Monroe is the center of a natural gas field extending over nine parishes. The city is served by river craft and three railroads. Selman Field, the airport, is three mi. east. Monroe is growing rapidly due to its industrial activities, which include the manufacture of pulp and paper, carbon black, printers ink and lumber products. In 1929 the factory output was approximately \$7,000,000; the retail trade amounted to \$17,619,637. The Spaniards founded a settlement here known as Ouachita Post, later Ft. Miro, in 1785. In 1819 it was named for President Monroe, the town being incorporated in 1820. Monroe was chartered as a city in 1871. Pop. 1920, 12,675; 1930, 26,028.

**MONROE**, a city of southeastern Michigan, the county seat of Monroe Co., situated on Lake Erie at the mouth of the Raisin River, about 40 mi. southwest of Detroit and 85 mi. southeast of Lansing. Transportation facilities include the Pere Marquette, the New York Central and the Grand Trunk railroads, bus lines and an airport. The city is a trading center for a considerable portion of southern Michigan. There are extensive fisheries and three large nurseries. Among the chief crops are oats, rye, wheat, corn, potatoes and beets. Manufactures include paper, boards and steel products. In 1929 the value of the factory output was about \$25,000,000; the retail trade amounted approximately to \$12,470,000. Gen. George A. Custer was a resident of Monroe. In 1784 the city was only a settlement of French Canadians, called Frenchtown. In 1813, the River Raisin Battle took place between the Americans and the British-Indian

forces. The town was named after James Monroe in 1815 and was incorporated in 1837. Pop. 1920, 11,573; 1930, 18,110.

**MONROE**, a city in southern North Carolina, the county seat of Union Co., situated 24 mi. southeast of Charlotte. It is served by the Seaboard Air Line Railroad. Cotton, small grains and hay are grown in this region. Gold is mined near by. Monroe's principal industries are cotton mills and gins, lumber mills, iron works, a rolling mill, a cottonseed products plant and tile factories. Pop. 1920, 4,084; 1930, 6,100.

**MONROE**, a city in southern Wisconsin, the county seat of Green Co., situated 48 mi. southwest of Madison. Bus lines and two railroads afford transportation. Monroe is a shipping market for dairy products. The chief local manufacture is Swiss cheese. Near by is Black Hawk battleground. The city was settled by the Swiss in 1849; incorporated in 1882. Pop. 1920, 4,788; 1930, 5,015.

**MONROE DOCTRINE**, the policy of the United States toward European intervention in the Western hemisphere, first enunciated by President Monroe in his annual message of Dec. 1823, and since modified and extended to later situations by the application of the principles then formulated. The policy of the United States was to recognize unreservedly the independence of the Latin-American republics. The existence of these fledgling nations was threatened by the Quadruple Alliance—Austria, Russia, Prussia and France—the object of which was to crush the system of representative government wherever it appeared. France, accordingly, used its forces to restore Ferdinand VII to power in Spain; the alliance next intended to restore to Spain its late domain in Latin America. At the same time it was feared by the American Government that Russia contemplated setting up a territorial establishment south of Alaska. George Canning, Foreign Secretary of Great Britain, first suggested a joint declaration in opposition to the proposed recovery of the Spanish colonies; John Quincy Adams, American Secretary of State, successfully insisted that the government "make an American cause and inflexibly adhere to that."

The principles outlined by Secretary Adams and expressed by President Monroe, were three: that the United States could not view any interference with the governments of Central and South America "for the purpose of oppressing them or in any other manner controlling their destiny, by a European power, in any other light than as the manifestation of an unfriendly disposition toward the United States"; that the United States would regard further colonization of American territory by any European power as "dangerous to our peace and safety"; and that the policy of the United States was not to interfere with the internal concerns of European powers, but to cultivate friendly relations with them. Later interpretations have put upon the United States occasional supervisory duties over Central American and South American countries so that European powers would have no reasonable cause to intervene.

Notable applications of the Doctrine against European nations include: declarations by American Secretaries of State warning Spain against the transfer of Cuba to any other European power; successful opposition to the extension of British control in the Mosquito Coast region (*see NICARAGUA, History*); formal notice made by Secretary of State Seward in 1865 that French troops be withdrawn from Mexico; Secretary Olney's protest to Great Britain, 1895, in the VENEZUELA BOUNDARY DISPUTE; and President Roosevelt's successful opposition to the intervention of European nations in Latin-American republics for the collection of debts (*see VENEZUELA, History*). The Monroe Doctrine was acknowledged in substance by European powers in admitting the United States into THE HAGUE CONVENTIONS with the reservation that nothing within the document should "be construed to imply a relinquishment by the United States of America of its traditional attitude toward purely American questions," and was explicitly acknowledged for the first time in Article 21 of the Covenant of the League of Nations, which provides that nothing in the Covenant should "affect the validity of . . . regional understandings like the Monroe Doctrine, for securing the maintenance of peace." Much opposition to the Doctrine exists in Latin America, however, where American influence has penetrated deeply into the governmental and financial affairs of the smaller republics. The theoretical basis of this assumption of authority has been that the Monroe Doctrine, in checking the territorial greed of European powers, placed upon the United States the obligation to protect the life and property of European nationals in Latin America against attack. President Roosevelt in this connection announced that "the exercise of an international police power" rested with the United States. The modification of the Monroe Doctrine in later corollaries has not weakened its significance as a cardinal feature of American foreign policy. E. D. B.

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**MONROVIA**, a seaport and capital of Liberia, Africa, near the mouth of the St. Paul River, between 6° 18' N. lat. and 10° 48' W. long. It was founded in 1821. Spanish and British ships maintain a regular steamship service, cables put it in close touch with New York and Europe and, in addition, there are two wireless stations. The town contains the Liberia College and a Methodist college, several missions and is the see of a Protestant Episcopal bishop. An active export trade in coffee, cocoa, rubber, ivory, palm oil and dyewoods is carried on, chiefly with Germany and England. Est. pop., including Kru-town, 10,000.

**MONROVIA**, a city in Los Angeles Co., southern California, situated 18 mi. northeast of Los Angeles, at the foot of the Sierra Madre mountains. Two railroads, the Pacific Electric Railway and truck and bus

lines afford transportation. There is a flying field and aviation school. The National Old Trail Highway passes here. The vicinity is noted for its healthful climate and its beautiful orange groves. Fruit-packing and the manufacture of water heaters are the leading industries. The retail trade in 1929 amounted to \$6,285,951. Monrovia was founded in 1886 and incorporated in 1887. Pop. 1920, 5,480; 1930, 10,890.

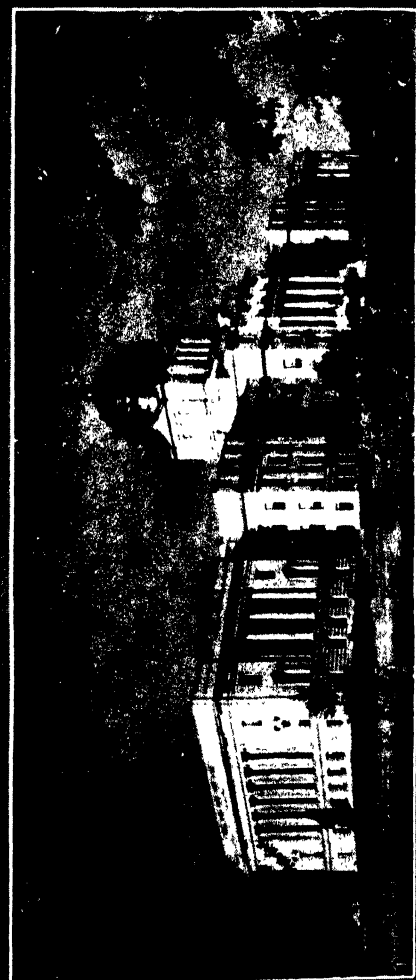
**MONS** (Flemish, *Bergen*), capital of the Belgian province of Hennegau located on the Trouille River. Noteworthy buildings are the Gothic collegiate church of Ste.-Wandru, 1450-1687, the late Gothic city hall, 1458-67, with a belfry, the Elizabeth Church, a large hospital and monuments of the old counts of Flanders. In the environs steel, soap, tobacco and artificial fertilizers are produced. There are foundries and machine factories and important coal mines. Pop. 1930, 27,719.

Although probably developed from a Roman citadel, Mons first assumed prominence early in the 9th century when Charlemagne made it the capital of the County of Hainaut. Having become an important fortress in the 14th century, and soon thereafter merged into the Duchy of Burgundy, its troubled history of sieges continued throughout the 15th, 16th, and 17th centuries. Finally, in 1682, it was made an open town. In the following century the important battles of Malpaquet, 1709, and Jemappes, 1792, were fought in its vicinity.

Mons was to have yet another chapter of military history during the World War. Here, the British Expeditionary Force under Sir John French entered into their first engagement with the Germans. Having advanced from Maubeuge, Aug. 22, 1914, to co-operate with the French in an offensive against the Germans who were sweeping through southern Belgium, the British found themselves, after the failure of the French to effect a crossing of the Sambre, in an exposed forward position. Although faced by overwhelming odds they made a stand at Mons on Aug. 23, in order to cover the left of the French army. The French retreated after the fall of Namur and the arrival of a fresh German army, and on the 24th the British, too, retired, barely escaping being surrounded. This engagement was followed shortly by the battle of Le Cateau and the decisive BATTLE OF THE MARNE, which by turning back the German invasion saved Paris.

**MONSOON**, any steady wind that blows in nearly opposite directions in different seasons, and more particularly the wind that blows between Asia and Australia. From May till September, during the northern summer, the air above Asia, and India especially, is warm and rarefied, that over Australia colder and denser; hence the wind blows from Australia toward India, and, being deflected according to BUYS BALLOT'S LAW, is called the South West Monsoon. From November until March the reverse conditions hold, and the wind blows in the opposite direction. In addition to their domination of the

# MONTANA



1. 4. COURTESY CHAMBER OF COMMERCE, HELENA; 2. 3. CHAMBER OF COMMERCE, MILES CITY

## MOUNTAIN AND RANCH SCENES IN MONTANA

1. State Capitol building at Helena.
2. First year homestead farm in southeastern Montana near Miles City.
3. Sticking to the saddle in a Miles City round-up.
4. Rocky Mountain scenery near the state capital.

# MONTANA



COURTESY CHAMBER OF COMMERCE, HELENA

## VALLEYS, RIVERS AND GORGES IN THE MOUNTAIN WONDERLAND OF MONTANA

1. Pine-dotted hills near Helena. 2, 3. Gates-of-the-Mountains on the Missouri River, eighteen miles from Helena, discovered and named by Lewis and Clarke in 1805.  
4. Jutting rock cliffs near Helena.



# MONTANA

Area 146,987 sq. m.  
Pop. 537,606

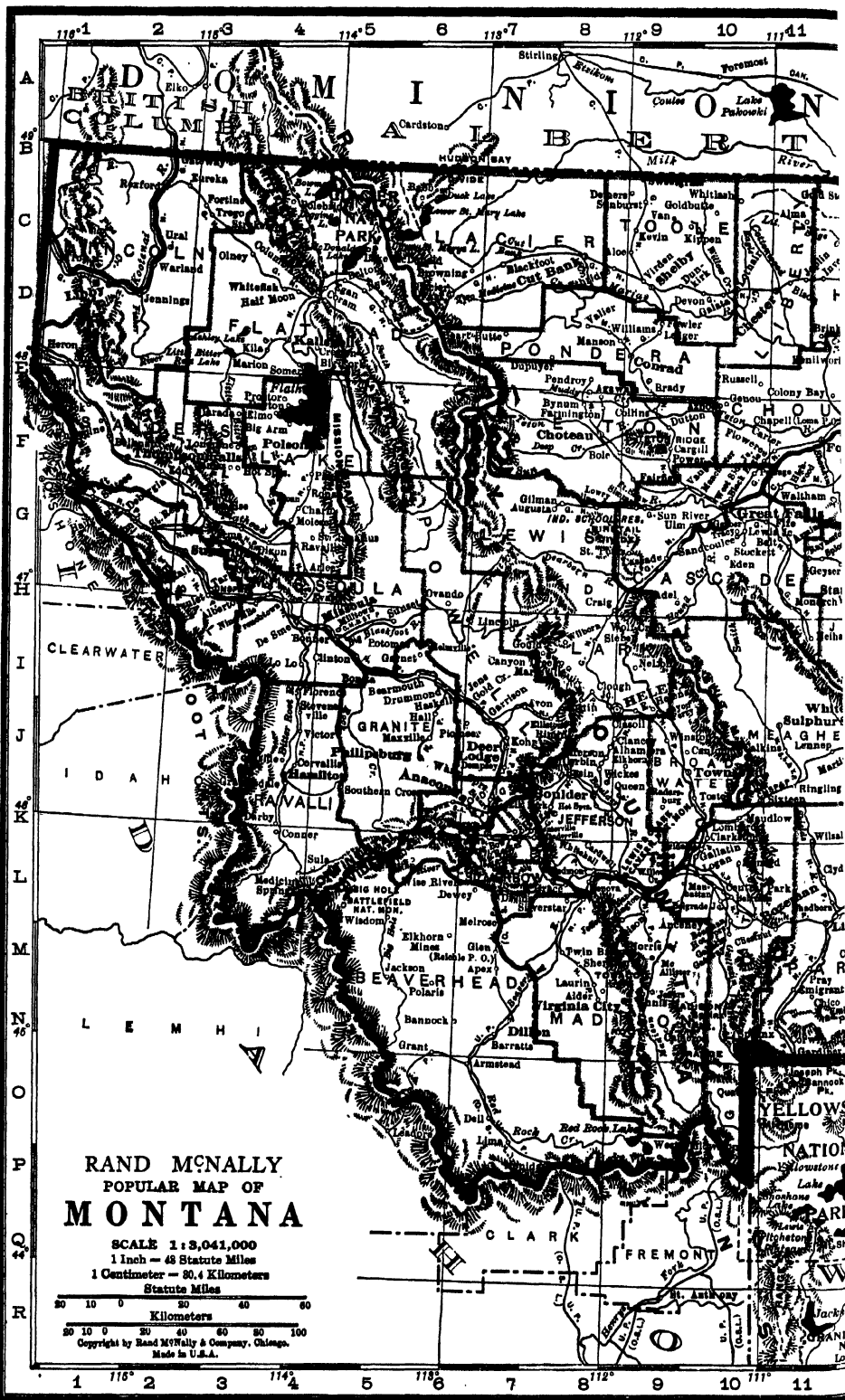
## PRINCIPAL CITIES

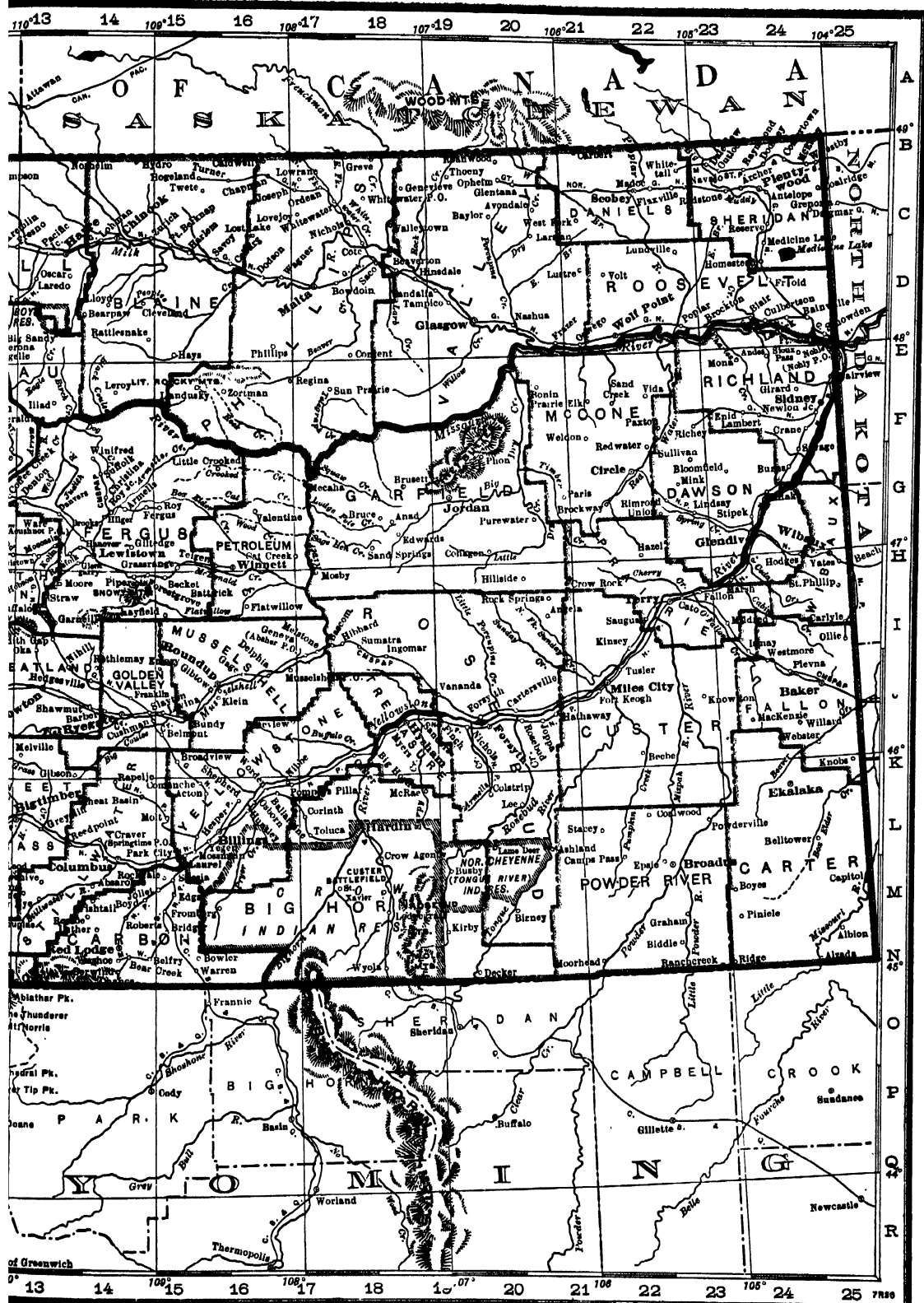
### Pop.—Thousands

- 13 Anaconda...K 6
- 1 Baker...J 25
- 1 Big Timber...L 13
- 10 Billings...L 16
- 7 Bozeman...L 10
- 40 Butte...K 7
- 1 Chinook...C 14
- 2 Conrad...E 9
- 1 Deer Lodge...J 7
- 2 Dillon...D 1
- 1 E. Helena...J 9
- 1 Ennis...M 9
- 2 Forsyth...K 30
- 1 Ft. Benton...F 11
- 2 Glasgow...L 19
- 5 Glendive...H 24
- 20 Great Falls...G 10
- 2 Hamilton...J 4
- 1 Hardin...L 18
- 2 Harlowton...L 13
- 6 Havre...D 13
- 13 Helena...J 8
- 6 Kalispell...E 4
- 3 Laurel...M 15
- 6 Lewistown...L 14
- 2 Libby...D 1
- 6 Livingston...M 12
- 1 Malta...D 17
- 7 Miles City...J 22
- 15 Missoula...H 4
- 1 Phillipsburg...H 4
- 1 Plentywood...C 24
- 1 Polson...F 4
- 1 Poplar...E 23
- 3 Red Lodge...N 15
- 3 Roundup...C 15
- 1 Scooby...C 22
- 2 Shelby...D 9
- 2 Sidney...F 24
- 2 Walkerville...K 7
- 3 Whitefish...J 4
- 2 Wolf Point...E 22

### Pop.—Hundreds

- 3 Alberton...H 3
- 5 Bainville...D 26
- 5 Bearcreek...N 15
- 5 Belgrade...D 15
- 5 Belt...G 11
- 4 Bigfork...E 4
- 6 Big Sandy...E 13
- 6 Boulder...K 8
- 6 Bridger...N 15
- 5 Cascade...H 9
- 4 Chester...D 11
- 9 Choteau...F 8
- 6 Circle...G 22
- 6 Columbia Falls...D 4
- 8 Columbus...M 14
- 5 Culbertson...D 24
- 8 Cut Bank...C 8
- 4 Denton...G 13
- 3 Ekalaka...E 24
- 9 Eureka...B 3
- 6 Fairview...E 25
- 4 Froid...D 24
- 4 Fromberg...M 15
- 7 Harlem...F 16
- 4 Hays...E 16
- 4 Hot Springs...F 3
- 4 Joliet...M 15
- 5 Lima...P 7
- 4 Lodge Grass...M 18
- 5 Manhattan...L 10
- 4 Medicine Lake...C 24
- 4 Nashua...E 20
- 4 Ophelm...C 20
- 4 Richey...F 23
- 5 Roman...G 4
- 5 Saco...D 18
- 4 St. Ignace...G 4
- 4 St. Regis...G 2
- 6 Sandcoulee...G 10
- 5 Sheridan...M 8
- 8 Somers...E 4
- 4 Southern Cross...K 6
- 5 Stanford...H 12
- 7 Stevensville...J 4
- 8 Stockert...G 10
- 5 Sunburst...C 9
- 4 Sweetgrass...C 9
- 5 Terry...I 22
- 5 Thompson Falls...F 2
- 9 Three Forks...L 9
- 7 Townsend...J 10
- 5 Troy...O 1
- 7 Twin Bridges...M 8
- 6 Valler...D 8
- 5 Victor...J 4
- 6 Whitehall...L 8
- 6 White Sulphur Springs...J 11
- 6 Wibaux...H 25









climate and the rainfall in the countries over which they blow, the monsoons in the days of sailing vessels were of great importance to navigation.

**MONSTER**, formerly any unknown or alarming form of animal life; in modern zoology, curious and repellent deviations from the norm of bodily development. Although applied to embryonic variations incapable of being born alive, the word is most commonly used for living abnormalities, following the classification first projected by Saint-Hilaire and later modified. One group comprises beings with imperfectly formed or missing extremities; another with facial or cranial distortions; another showing duplication of principal parts of the body, including those rare cases of composite or double monsters known as "Siamese Twins." In some cases, such duplication takes the form of a parasitic attachment without separate life. Another class is that of hermaphroditism, or possession of both male and female sex indications. An early student of monstrosities was William Harvey, first to describe them as abnormal embryonic developments. As teratology, the study was first systematized by E. Geoffroy Saint-Hilaire, mentioned above and by his son, whose writings are still authoritative. G. E. F.

**MONSTRANCE** (from the Latin *monstrare*, to show), also called Ostensorium, in the Catholic Church, a liturgical utensil consisting of a glass or crystal vessel for the consecrated Host. It rests on a stem with a broad pedestal and is surrounded by rays of precious or gilded metal. The monstrance is sometimes ornamented with precious stones and its best examples, mostly of the Gothic period, are of great artistic value. See also BENEDICTION; TRANSUBSTANTIATION.

**MONTAGNAIS**, a group of related North American Indian tribes belonging to the Algonkian linguistic stock. Their territory in Canada extended from the St. Maurice River almost to the Atlantic Ocean, and from the St. Lawrence River to the Hudson Bay watershed. The Montagnais tribes speak well-defined dialects of Algonkian which seem to be most closely related to the CREE of Athabaska Lake. They were allies of the French and were often at war with the Micmac and Eskimo, but the Iroquois were their real and constant enemies, driving them northward from the St. Lawrence. They have been long under missionary influence. They are still nomadic hunters, loosely organized into bands and eking out a hazardous existence.

**MONTAGUE, CHARLES EDWARD** (1867-1928), English editor and author, was born in England, Jan. 1, 1867, and educated at Oxford. In 1890 he became associated with the *Manchester Guardian* and in 1896 was promoted to chief leader writer. He remained with this journal until 1925 when he retired to devote himself to writing. During the World War he served as a press censor in England. Montague's publications include *A Hind Let Loose*, 1910, *Rough Justice*, 1926, and *Right Off the Map*, 1927. He died at Manchester, May 28, 1928.

**MONTAGUE, LADY MARY WORTLEY** (1689-1762), English letter writer, was born at London, May 26, 1689. Her father became Duke of Kingston, and her husband, Edward Wortley Montague, was appointed Ambassador to Turkey in 1718. There Lady Mary wrote the famous *Letters*. Her epistolary writings rank her high in that field of literature. After her return to England, ALEXANDER POPE, who had quarreled with her, cruelly lampooned Lady Montague, and Jonathan Swift also attacked her; likewise HORACE WALPOLE was among her detractors. Her *salon* in London was famous, however, and the term "Blue-Stocking" was first applied to the intellectual Lady Montague. (See BAS BLEU.) In 1739 she went abroad, living apart from her husband and suffering from a painful skin disease, a tragic close to a picturesque career. She returned to England the year of her death, which occurred at London, Aug. 21, 1762.

**MONTAGUE**, a town and paper-manufacturing village, in Franklin Co., northwestern Massachusetts. The town contains the villages of Turners Falls, Montague Centre and Millers Falls. Montague is situated on the Connecticut River, 38 mi. north of Springfield and is served by two railroads. Hydroelectric power is derived from the river. The town was incorporated in 1753. Pop. 1920, 7,675; 1930, 8,081.

**MONTAIGNE, MICHEL DE** (1533-92), French writer, was born at the château de Montaigne in Périgord, southern France, Feb. 28, 1533. His early years included fighting, law experience and court life in Paris. In 1568 he succeeded to the Montaigne estates and 3 years later settled at the family château, deciding to live there a life of study and meditation. His famous *Essays* were the outcome of this determination. They are of a miscellaneous character, set down haphazard as the subjects entered Montaigne's head, for, as he said, he was writing for himself alone, and not for money or renown. The first two books appeared in 1580; the third in 1588. The *Essays* have enjoyed immense popularity with all races and all conditions of men. Montaigne died at the château of Montaigne, Sept. 13, 1592, and is buried at Bordeaux.

**BIBLIOGRAPHY.**—Best trans. of *Essays* by John Florio and by Charles Cotton, numerous ed. of both; E. Dowden, *Michel de Montaigne*, 1905; I. C. Willis, *Montaigne*, 1927.

**MONTALVO, JUAN** (d. 1889). Juan Montalvo is famous in the history of Ecuador for his unrelenting attacks upon the tyrant Garcia Moreno (1821-75), and in the literature of Spanish America for his essays in the manner, if not in the matter, of MICHEL DE MONTAIGNE. Garcia Moreno was finally slain by followers of Montalvo, who later wrote, "My pen slew him, but having seen what I have seen after his death, I believe that I should have been glad to let this tyrant live." In 1882 Montalvo went to Paris to live; here he died in 1889, in proud poverty, as independent in death as he had been in life. His most noted works are the *Siete Tratados* or *Seven*

*Essays, Capítulos que se olvidaron a Cervantes, or Chapters That Cervantes Forgot, and Geometria Moral.* Despite his rambling methods, Montalvo is accounted one of the great Spanish-American stylists.

**MONTANA**, one of the northwestern states of the United States popularly called the "Bonanza State," is situated between  $44^{\circ} 26'$  and  $49^{\circ}$  N. lat. and  $104^{\circ}$  and  $116^{\circ}$  W. long. It is



MONTANA STATE SEAL

bounded on the north by British Columbia, Alberta, and Saskatchewan, on the east by North Dakota and South Dakota, on the south by Wyoming and Idaho and on the west by Idaho. Montana comprises an area of 146,997 sq. mi., inclusive of 866 sq. mi. of water surface with a maximum length from east to west of 540 mi. and an average width from north to south of 275 mi. In size Montana ranks third among the states of the Union.

**Surface Features.** The western one-third of Montana is covered by the Rocky Mountains and the remainder lies within the Missouri Plateau, a subdivision of the Great Plains. As a whole the state has a mean elevation above sea level of 3,400 ft., and a relief varying from 12,850 ft. on the summit of Granite Peak in Park County to 1,800 ft., the level of the Kootenai River in Flathead County. The elevations of both mountains and plains are much less than those of Colorado, Wyoming and states south.

The mountains are divided into series of north and south ranges separated by broad, cultivated valleys, of which the outstanding one is the Rocky Mountain Trench containing Flathead Lake. North of the lake the trench extends between the Flathead Mountains on the west and Swan and Galton Ranges on the east, far into Canada. South of the lake it continues for 150 mi. between the Mission and Sapphire mountains on the east and Bitter Root Mountains on the west. The latter range defines the boundary between Montana and Idaho. Next to the Canadian line, east of the trench, are the Lewis and Clark Ranges which lie within Glacier National Park.

The mountains of southern Montana are cut into relatively small masses with broad intervening valleys. They include the Anaconda Range; the Ruby, Jefferson and Snowcrest ranges between the Beaverhead and Madison rivers and the Madison and Gallatin ranges east of the Madison river. In addition, there are numerous semi-detached ranges rising above the plains to the east.

The plains region is a rolling tableland cut from west to east by the broad terraced valleys of the Missouri and Yellowstone rivers and their tributaries. The trough of the Missouri is 400 to 500 ft. deep and winds between bluffs from one to three miles apart. On the interstream uplands are numerous mesas and

buttes as well as outlying mountain masses. Between the Milk and Missouri rivers are the Bearpaw Mountains, a volcanic group, and the Little Rocky Mountains, and between the Missouri and Musselshell are the Big Snowy and Little Belt ranges.

Following the crests of the easternmost high ranges is the Continental Divide which parts the headwaters of the Columbia and Missouri river systems.

**Climate.** Although subject to great extremes of temperature, the climate of Montana is dry and bracing. The warm dry "Chinook" winds modify the climate of the western part of the state, but in the eastern plains the winters are long and cold and the summers hot. The mean annual temperature is  $42.3^{\circ}$  F., ranging from about  $37^{\circ}$  F. in the extreme northeast to  $47^{\circ}$  F. in the mountain valleys in the west. A range of extremes from  $100^{\circ}$  F. to  $-40^{\circ}$  F. on the Great Plains is not uncommon. During the period 1895-1930, the highest temperature recorded in Montana was  $113^{\circ}$  F. and the lowest,  $-61^{\circ}$  F. The average annual precipitation is 15.4 in., including about 54.5 in. of snow, with a minimum of 10 in. on the Great Plains and a maximum of 20 in. in the northwest. The average growing season at Helena is 142 days; at Havre, 126 days; at Kalispell, 150 days.

**Forests and Parks.** The extensive forests of Montana are coniferous, chiefly white and yellow pine, larch, spruce, Douglas fir and lodgepole pine with small scattered stands of cottonwood, aspen and alder along the water courses. The majority of the forests and the heaviest stands are in the mountainous regions of the western third of the state. The region known as the "eastern forest" lies east of and relatively close to the Continental Divide and contains valuable stands of Douglas fir. The total forested area, according to a 1931 estimate, is 20,500,000 acres or approximately 22% of the land area. Seven state forests comprising 202,949 acres in the Rocky Mountains of western Montana were created in 1925. Additional scattered state holdings total 297,000 acres. Seventeen national forests with a total net area in 1930 of 16,174,810 acres or approximately three-fourths of the timber of the state are situated in both eastern and western Montana. State and national forests are popular camping grounds. Restricted hunting and fishing is permitted. GLACIER NATIONAL PARK is located in Montana and 240 acres of YELLOWSTONE NATIONAL PARK, also LEWIS AND CLARK CAVERN and BIG HOLE BATTLEFIELD National Monuments.

**Minerals and Mining.** Montana possesses very extensive mineral resources, and, next to agriculture, mining is the most important industry. For many years the state has been a leading producer of copper. During the period from 1880 to 1930 it is estimated that Montana contributed one-fourth of all the copper mined in the United States. This immense output was produced at Butte within an area of only a few square miles, the combined yield up to 1930 of copper and other metals in this limited field amounting to upwards of two billion dollars. The state also ranks

high as a producer of gold, silver, zinc and lead, recovered in considerable part in refining copper ores. Large areas in various parts of the state are underlaid with coal beds, chiefly lignite. There are also numerous minerals of minor importance.

With mineral productions in 1929 amounting to \$93,842,135, Montana stood sixteenth among the states, ranking first in white arsenic and manganese ore, second in silver, third in copper, fourth in zinc and seventh in gold and lead. The outstanding mineral product was copper, 297,725,973 lbs., valued at \$52,399,771. Other leading products in order of value were zinc, 68,176 tons, \$8,999,214; coal, 3,407,526 tons, \$7,561,000; petroleum, 3,980,000 bbls., \$7,260,000; silver, 12,716,977 oz., \$6,778,149; lead, 19,607 tons, \$2,470,464; natural gas, 9,659,000 M cu. ft., \$2,377,000; gold, 54,758 oz., \$1,131,949; and white arsenic, 9,502 tons, \$850,750.

During 1929 173 mines and quarries gave employment to 15,565 persons, who received \$28,965,579 in salaries and wages.

**Soil.** For the most part, the soil of Montana is made up of a sandy loam overlying beds of gravel. On the whole it does not possess great fertility and is largely occupied by extensive sheep and cattle ranges. There are, however, considerable areas where the soil is suitable for the production of wheat by dry farming and also for the production of various other crops under irrigation. Many valleys in the mountains possess alluvial deposits which are exceptionally productive. The larger river bottoms in the plains likewise contain rich alluvial soils.

**Agriculture.** The principal crops produced are grains, mostly wheat; hay, largely alfalfa, potatoes, and sugar beets.

In 1930 44,659,152 ac. or 47.8% of the entire land area was in farms, 47,495 in number, with an average size per farm of 940.3 ac. and an average value per acre of \$11.81. Of the farm area 11,398,921 ac. was crop land, and 31,676,374 ac. pasture land. The total value of farm property was \$708,364,045, of which \$527,610,002 was represented by land and buildings; \$62,070,274, by implements and machinery; and \$118,683,769, by domestic animals.

According to the census of 1930 Montana produced in 1929 field crops to the value of \$87,638,808, ranking thirty-third among the states. It stood fourth in flaxseed and seventh in wheat and sugar beets. The crops were chiefly grains, \$53,443,412; hay, 2,235,052 tons, \$25,689,902, including alfalfa, 1,126,320 tons; vegetables, \$4,774,258; sugar beets, 361,752 tons, \$2,637,172, and fruits, \$1,056,268. The grains included wheat, 40,558,049 bu., produced from 4,418,588 ac.; oats, 4,809,018 bu.; barley, 3,798,109 bu., and flaxseed, 1,177,086 bu. The chief vegetable crop was potatoes, valued at \$2,928,108; the leading fruit was apples, 555,387 bu. Farm products sold by cooperative marketing rose from \$1,538,303 in 1919 to \$6,730,386 in 1929. Farm machinery and equipment in 1930 included 38,166 automobiles, 14,615 motor trucks, 19,031 tractors, 1,708 electric motors, and 13,639 stationary gas engines.

**Irrigation.** Montana ranks fourth among the states in extent and value of land irrigated and fifth in amount of investments made in irrigation enterprises. In the Census of 1930 irrigation operations are reported in detail for 50 of the 56 counties in the state. Although well-established in many widely separated districts, irrigation has been most extensively developed in the southwestern quarter of the state, chiefly in the drainage basins of the Yellowstone and Jefferson rivers. There is also a substantial development along the Clark Fork and other tributaries of the Columbia River. Irrigated farms comprised 25% of the number and 36% of the value of all farms in Montana. About one-seventh of all crop land is irrigated. The proportion of irrigated land is 3.6% of all land in farms and 1.7% of the total land area of the state.

The total number of irrigated farms was 11,925, with an aggregate area of 12,032,619 ac., of which 1,594,912 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$190,057,936, or an average of \$15.80 per ac. The total investment in irrigation enterprises to 1930 was \$50,319,204, and the average cost of maintenance and operation for 1929 was \$0.87 per ac.

**Animal Industry.** Cattle- and sheep-raising are the chief livestock interests. According to the census of 1930 Montana stood third among the states in number of sheep on farms and second in pounds of wool shorn. The state ranked eighteenth in total value, \$118,683,769, of domestic animals on farms. Among these were 1,290,383 cattle reported from 37,670 farms or 79% of all farms in the state and valued at \$68,313,045; sheep, 4,027,457 in number and valued at \$32,186,608; horses, 450,264, \$13,455,125; mules, 8,153, \$378,788, and swine, 210,036, \$2,675,685.

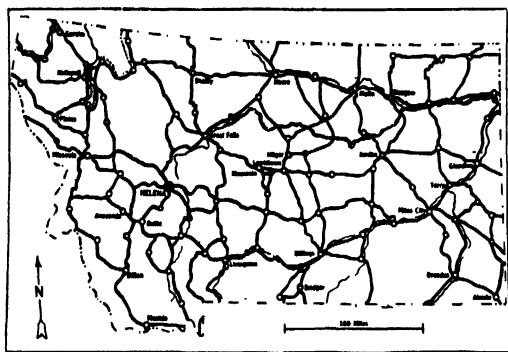
Of the cows on farms, 460,737 were kept mainly for beef production and 185,943 mainly for milk production. In 1929 87,377,918 gals. of milk were produced; the total value of dairy products sold was \$10,598,673. The wool clip, 29,111,557 lbs., was valued at \$9,212,169. The poultry raised, with a value of \$3,993,542, included chickens, 3,663,904 in number valued at \$2,625,455, and turkeys, 442,259, \$1,272,167. Of 15,428,608 doz. chicken eggs produced, valued at \$4,243,995, 7,794,634 doz., with a value of \$2,161,281, were marketed. Honey, amounting to 1,433,191 lbs. valued at \$162,246, was produced from 21,232 hives.

**Fisheries.** There are no commercial fisheries in Montana, but the many streams offer some of the finest trout fishing in the world. At least five species of trout in streams and many other game fish, including lake trout and grayling, are found. In 1930, the state issued 85,878 fishing licenses to sportsmen who paid \$184,644 in fees. Fourteen hatcheries were operated, at a cost of \$68,167 and employed 18 men. Large plantings from these hatcheries in 1930 included 26,401,334 trout, 284,350 bass, 10,646,200 other game fish and 999,000 commercial species. Cooperating with the state, the United States Bureau of Fisheries in 1930 planted the following in Montana waters,

especially those of the national forests: 3,319,050 rainbow trout, 2,969,350 black spotted trout, 7,702,000 loch leven trout, 1,100,000 grayling, 214,000 brook trout, 46,800 golden trout, 60,850 crappie, 11,675 sunfish, and 57,202 large mouth black bass.

**Transportation.** There are no navigable rivers in Montana. Three transcontinental systems, the Great Northern, Northern Pacific and the Milwaukee, control most of the state's railway mileage, which aggregated 5,231 in 1930. The Burlington and the Oregon Short Line serve as connecting links in the state railway system, which is adequate in the western portion of the state, but somewhat unsatisfactory on the eastern plateau, chiefly a stock raising region. Three Federal highways cross the state, namely the Roosevelt, the Yellowstone and the National Park.

On Jan. 1, 1930, the total highway mileage was 70,509, including 3,437 mi. of surfaced roads and 1,513 mi. of state highways. Highway expenditures



MONTANA STATE ROADS

during 1929 were \$9,031,815, of which \$4,481,815 was paid by the state and \$4,550,000 by county and local governments. The state gasoline tax produced an income of \$2,941,875 in 1930 as against \$870,712 in 1926. Motor vehicle registrations were 135,168 in 1930 compared with 94,656 in 1925. The rapid growth of transportation by truck is indicated by registrations, which rose from 12,521 in 1925 to 25,619 in 1930, or over 100%. During the same period, however, the number of buses in operation decreased from 768 to 512.

**Manufactures.** The chief manufactures are those connected with mining operations, especially the smelting of metals, which in value comprise about two-thirds of the factory products of the state. Though still small in total volume the state's general manufactures are developing rapidly through the use of hydro-electric power, the increase from 1909 to 1929 exceeding 270%.

According to the Census of 1930 Montana with manufactures for 1929 valued at \$271,094,446 stood thirty-fifth among the states. Its 589 establishments gave employment to 2,266 officers and employees, who received \$5,254,612 in salaries, and to 14,869 wage earners, who were paid \$24,214,895 in wages.

These factories used a total of 197,781 horse power, expended \$4,284,878 for fuel and power, and \$205,560,560 for materials and supplies, and added by the process of manufacture \$61,249,008 to the value of their output.

In this output the manufactures not separately enumerated, including smelting and various other industries, were valued at \$194,000,000. Among the 26 groups of products separately reported were flour, \$13,363,353; lumber, \$11,554,627; steam railway car-shop construction and repair, \$9,683,123; petroleum refining, \$8,409,230; meat packing, \$7,026,759; butter, \$6,868,666; printing and publishing, \$5,121,308, and beat sugar, \$4,994,364.

The principal manufacturing districts with approximate value of products were Cascade Co., about \$104,000,000, which included Great Falls, with about \$10,000,000; Deer Lodge Co., including Anaconda, about \$62,000,000, and Lewis and Clark, surrounding Helena, about \$16,000,000.

**Commerce.** According to the census of 1930, there were in 1929 1,249 wholesaling establishments in Montana, with total sales of \$158,545,212. These organizations gave full-time employment to 4,436 men and women, whose annual salaries and wages aggregated \$6,991,435.

The total sales of the 6,996 retail stores amounted to \$240,082,195. Sales per store averaged \$34,317; sales per capita were \$446.58.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive . . . . .	1,329	\$56,194,368	23.42
General Mdse. . . . .	899	50,815,790	21.16
Food . . . . .	1,528	45,297,769	18.86
Lumber & Bldg. . . . .	474	18,700,270	7.78
Apparel . . . . .	441	13,468,290	5.63
Furn. & Household . . . . .	199	6,795,985	2.82
All other stores . . . . .	2,126	48,809,723	20.33
Total, all stores . . . . .	6,996	\$240,082,195	100.00

**Finance and Banking.** The assessed value of all taxable property in 1929 was \$1,391,982,638. The total bonded debt in 1930 was \$5,590,989, less sinking funds of \$1,201,045. The total state revenues in 1928 were \$11,235,840. The chief sources of income were gasoline taxes, \$1,763,614, and inheritance, mine and corporation and property taxes. Total expenditures in 1928 were \$10,511,161. The principal payments were for highways, \$4,078,074, educational aid, \$1,542,944, and operation of general departments and debt service.

There were 172 banks in Montana in 1930. Of these, 59 were national banks, 112 trust companies and state banks and 1 private bank. Their total capital was \$11,220,000; their surplus and undivided profits, \$8,822,000. Total resources were \$176,674,000, with loans and discounts aggregating \$79,757,000. Demand and time deposits totaled \$142,371,000. Per capita demand and time deposits were \$265.62; per capita savings deposits, \$118.90. The total savings of \$63,731,000 were owned by 88,992 depositors. National bank circulation aggregated \$2,251,000.

**Government.** The law-making power of the state is vested in a legislative assembly, consisting of a senate composed of 55 members and a house of representatives of 100 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 60 days. The governor, lieutenant governor, secretary of state, attorney-general, treasurer, auditor and superintendent of public instruction, all elected for terms of four years, form the executive branch of the government. The governor receives a salary of \$7,500 per annum. Judicial power is vested in a supreme court, in district courts and in justices of the peace. The supreme court consists of five judges elected for terms of six years at salaries of \$6,000 per year.

**Social Welfare Institutions.** There is a vocational school for girls at Helena, schools for the deaf, blind and feeble-minded at Boulder and an industrial school for boys at Miles City. An orphans' home is at Twin Bridges and a soldiers' home at Columbia Falls. The state hospital for the insane is at Warm Springs and a hospital for tubercular patients at Galen. The prison is at Deer Lodge.

**Education.** The first schools were provided by the school law of 1864, and four years later there were about 700 pupils enrolled in the schools of the state. In 1883 the first high school was established at Butte. There were 5,214 teachers and 93,698 pupils in the 3,055 public elementary schools in 1928. The 193 high schools had 1,163 teachers and 24,274 pupils. Children from 8 to 16 years of age are required by law to attend the full school term.

The number of persons from 5 to 20 years of age attending school in 1930 was 126,657, or 74.6%, of the population within the ages specified, as compared with 113,419, or 70.5%, in 1920. The number of persons 10 years and over, unable to read and write in 1930 was 7,303, or 1.7%; and 9,544, or 2.3%, in 1920. Foreign-born white illiterates numbered 3,085 or 4.3%, in 1930, and 5,178, or 5.6%, in 1920.

The state institutions for higher education include the University of Montana at Missoula, the College of Agriculture and Mechanic Arts at Bozeman, the School of Mines at Butte and the State Normal School at Dillon. These are all controlled by one administrative head, the chancellor of the University of Montana. Other institutions of higher learning are Inter-mountain Union College and Mount St. Charles College, both at Helena.

**Population.** In 1930 Montana ranked thirty-ninth among the states with a population of 537,606 or an average of 3.7 per square mile, a decrease of 11,283 or 2.1% over 1920. The population rose from 20,595 in 1870 to 243,329 in 1900, 376,053 in 1910 and to 548,889 in 1920. In 1930 there were 517,327 or 96.2% whites, 1,256 or 0.2% Negroes, and 14,798 or 2.8% Indians. Of the whites 444,366 were native born and 72,961 were foreign born. The rural population was 356,570 or 66.3% of the total, a decrease of 20,308 or 5.4% from 1920; the urban population was 181,036 or 33.7% of the total, an increase of 9,025 or 5.2%

from 1920. In 1930 the six largest cities were Butte, 39,532; Great Falls, 28,822; Billings, 16,380; Missoula, 14,657; Anaconda, 12,494; Helena, 11,803.

**Occupations.** In 1930 216,479 persons, or 40.3% of the population, were gainful workers 10 years old or older; 85.1% of these were males and 14.9% were females; 76.5% were native white; 20.5% foreign-born white, and 2.7% other races. Among the chief occupations, with number of workers, were agriculture, 79,518; manufacturing, 33,618; trade, 20,735; transportation and communication, 19,079; domestic and personal service, 17,283; professional service, 14,956; mining, 14,952, and clerical service, 10,558.

## HISTORY

Montana, the "Treasure State," was perhaps first seen by white men in 1742 or 1743 when two French fur traders from Canada, Pierre and Chevalier de La Verendrye, wandered rather widely through a portion of the Rocky Mountain region; but the record of their explorations is indefinite. The next visit from civilization was paid by the LEWIS AND CLARK EXPEDITION, 1805-1807. That portion of Montana east of the CONTINENTAL DIVIDE was included in the LOUISIANA PURCHASE, but that part west of the mountains was part of the OREGON country. The latter was held jointly by the United States and Great Britain until 1846. Fur traders began pushing into the country after the account of the Lewis and Clark exploration was published. The first structure erected was a trading post built by Manuel Lisa, a fur trader from St. Louis, in 1807, at the mouth of the Big Horn River. In that year one of his men, John Colter, was lost in the Yellowstone country, and, in his wanderings, discovered the region that is now YELLOWSTONE PARK. The fur trade west of the divide was monopolized by the HUDSON'S BAY COMPANY and that east of it by the American Fur Company, whose representative, Kenneth McKenzie, ruled the traders and the Indians of an extensive region.

The first permanent settlement was made at Ft. Benton in 1846. Father Peter John De Smet went to the Bitter Root Valley country in 1840 in response to repeated requests from the Indians for missions of "Black Robes," founded St. Mary's Mission the next year and worked long among the Indians. The first important immigration into Montana came with the discovery of gold on Gold Creek in 1858 and other discoveries in following years. Enormous quantities of gold dust were taken from placer deposits in various districts, one of which, Alder Gulch, was one of the richest in the world. Montana was organized as a separate territory in 1864, and became a state Nov. 8, 1889, its population being 132,000 and Helena its capital. The development of mining brought serious troubles with the Indians, who had previously been friendly; these culminated in 1876 in the disastrous battle on the Little Big Horn, in which Gen. G. A. CUSTER's command was annihilated by the Sioux under Sitting Bull, and in the remarkable attempt, defeated by Gen. N. A. MILES,

of the Nez Percés, led by Chief Joseph, the next year to escape from their reservation into Canada.

Republican in politics in 1920, 1924 and 1928, in 1932 Montana gave its four electoral votes to Franklin D. Roosevelt, and reelected John E. Erickson, Democrat, to the governorship.

**BIBLIOGRAPHY.**—H. F. Sanders, *History of Montana*, 1913; Tom Stout, *Montana, its Story and Biography*, 1921.

**MONTANA, STATE UNIVERSITY OF**, at Missoula, Mont., a coeducational institution established in 1893, is one of the six state institutions which is comprised in the University of Montana. The State University maintains schools and colleges of Arts and Sciences, Forestry, Journalism, Law, Music, Pharmacy, Commerce and Graduate Work. There is a biological station at Flathead Lake. The grounds and buildings in 1931 were valued at \$1,948,304. The library of 145,000 volumes contains special collections in Northwest history. In 1930 there were 1,500 students, exclusive of the correspondence and summer session enrollment, and a faculty of 108 headed by Pres. C. H. Clapp.

**MONTANA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS**, at Bozeman, Mont., a state-controlled technological college for men and women founded in 1893, is one of the six state institutions of learning comprised in the University of Montana. The institution maintains courses in engineering, agriculture, applied science, household and industrial arts. The grounds and buildings were valued in 1931 at \$1,745,000. The library contained 39,974 volumes. In 1931-32 there were 1,083 students, and a faculty of 97 headed by Pres. Alfred Atkinson.

**MONTANISTS**, the followers of Montanus, a Phrygian priest who founded a sect sprung from the Catholic Church. Montanus believed in the spiritual church with no concern in secular matters and in the glorification of Jesus Christ on earth in his own kingdom. In his sermons he argued that true Christians would avoid connecting the church with matters of state, to keep it pure until the second advent of the Lord. He was assisted by Prisca and Maximilla, two women who were as zealous as Montanus in their work of persuading man to live a strict and holy life. The members of the sect were called Kataphrygians and were pronounced heretics by the Catholic Church. In the later development of the movement the Montanists set up their own church organization and spread from Spain to Constantinople and from Gaul to Africa. The sect survived until the 6th century.

**MONTAUBAN**, a city located on the Tarn River in southern France and capital of the department of Tarn-et-Garonne. In the 16th century it became one of the foremost Protestant centers of France and in 1621 was besieged by Louis XIII. A bridge dating from the 14th century crosses the river and the 17th century brick arcades of the Place Nationale are also celebrated. Montauban has a fine collection of the works of the painter INGRES, born here in 1781. It is

a center of agricultural trade. In 1930 a disastrous flood with great loss of life destroyed much of the town's riverside district. Pop. 1931, 29,981.

**MONTAUK**, a name often loosely applied to the Algonkian tribes occupying all but the western end of Long Island in New York, but in its more limited sense referring to the Indians occupying what is now Suffolk Co. on the eastern end of Long Island, and controlling all the remaining tribes of the Island, except those of the easternmost end. The Montauk were subjugated by the Pequot, but upon the annihilation of the latter in 1637, the Narragansett compelled them to seek the protection of the white settlers at Easthampton. They dwindled from an estimated population of 500 in 1659 to 162 in 1788 when they joined the Brotherton Indians. Even those few who early in the 19th century joined the Shinnecock maintained some semblance of their tribal organization until about 1875. Some mixed-bloods still exist.

**MONTCALM, LOUIS JOSEPH DE MONTCALM-GOZON, MARQUIS DE** (1712-59), French general, was born near Nîmes, France, Feb. 29, 1712. He entered the army at 15 years of age, became colonel in 1743, and brigadier in 1747. In 1756 as a major general he went to Canada, and the same year captured the English post at Oswego. In 1757 he seized Fort William Henry, and July 8, 1758, repulsed Abercromby's attack on Ticonderoga. From July to September 1759 Montcalm defended Quebec against Wolfe, being mortally wounded at the battle on the Heights of Abraham, Sept. 13, 1759, and dying the following day at Quebec.

**MONTCLAIR**, a town of Essex Co., N.J., located 12 mi. northwest of the New Jersey terminus of the Holland Tunnel. Its transportation facilities include the Erie and Lackawanna railroads, electric trolleys and motor bus lines. The town is characterized by broad, shady streets and fine schools and residences, and the western part of the town, which is situated on the sharp slope of the Orange Mountains, affords a superb view of the Metropolitan district. It is primarily a residential suburb of New York City and Newark, but there are a small number of local industries. In 1929 the value of the manufactures was about \$2,000,000; the retail trade amounted to \$28,521,436. Settled in 1660 and originally known as Cranetown and later as West Bloomfield, it was separated from Bloomfield township in 1868. Montclair received its charter as a town in 1894 and in 1916 adopted the commission form of government. Pop. 1920, 28,810; 1930, 42,017.

**MONTEBELLO**, a city in Los Angeles Co., southern California, situated on the Rio Hondo, eight mi. east of Los Angeles, served by buses and two railroads. The East Los Angeles Airport is on the city's outskirts. Flower-growing is the leading interest of the vicinity. Near by are the Montebello Oil Fields. Oil refining and the manufacture of tires and other rubber products are the chief local industries. Montebello was founded about 1900 and incorporated in 1920. Pop. 1920, 2,582; 1930, 5,498.

**MONTE CARLO.** See **MONACO.**

**MONTEMAYOR, JORGE DE** (c. 1520-61), Spanish novelist, was born at Montemôro Velho, about 1520. He changed his name from Montemôr to Montemayor for love of Spain. As a Spanish court musician he accompanied the Infanta Juana to Lisbon and later visited England in the train of Philip II. He is noted for his *Diana*, a pastoral prose romance published about 1560. This work was later largely the basis of Sir Philip Sidney's *ARCADIA* and Shakespeare's *TWO GENTLEMEN OF VERONA*. On account of a love-affair Montemayor was murdered at Turin, Italy, Feb. 26, 1561.

**MONTENEGRO**, formerly a country in the south-eastern part of Europe, surrounded by Dalmatia, Herzegovina, Albania and the Adriatic Sea. The area, about 3,500 sq. mi., was largely mountainous, and the inhabitants chiefly engaged in cattle-raising. Montenegro arose as a principality under the Balsha family in 1356 from the wreckage of the Serbian kingdom of Stephen Dusan. In 1421 the rule passed to the Crenojevic family who, like their predecessors, survived in their mountainous principality only by waging constant war against the Turks. The capital, Zabljak, was burned in 1484 to prevent its seizure by the Turks and a new capital was erected at Cetinje. From 1516 to 1696 the country was ruled by its bishops (of the Eastern Church) and during this period hostility to the Turks gradually relaxed. With the accession of Danilo Petrovic as prince, in 1696 however, this situation altered. Nearly all the Mohammedan settlers were murdered in 1702 and Danilo turned to Russia for support against the Turks. In 1868 a constitution was drawn up and a regular army was formed in place of the old levies. From the Berlin Conference ten years later Montenegro obtained a considerable addition of territory, although not so much as was originally granted her in the Treaty of SAN STEFANO. In 1910 Prince Nicholas declared his country a kingdom. Montenegro entered the World War but was defeated and occupied by the Austrians in Jan. 1916, Nicholas fleeing the country. In Nov. 1918, after the Austrian evacuation, a council at Podgorica voted for union with Serbia, the kingdom of Serbs, Croats and Slovenes in the present Yugoslavia. Despite the opposition of Nicholas, who lost his throne, this was carried out.

**MONTEREY**, a small North American Indian group which lived in Monterey Co., Cal., and spoke a dialect of the Costanoan linguistic stock.

**MONTEREY**, a beautiful and historic city in Monterey Co., western California, at the southern end of Monterey Bay, 90 mi. southeast of San Francisco. It is served by the Southern Pacific Railroad, bus lines and coastwise freight steamers. Fishing, especially sardine fishing, is the outstanding industry on Monterey Bay. The city has large sardine canning and fish packing houses, and in 1929 some 323,301,506 lbs. of sardines were brought in from the waters of the vicinity. Monterey, with its wooded hills, rocky cliffs and extraordinary pine and cypress

trees is a fashionable resort and a noted artist colony. Monterey Bay was discovered by Juan Cabrillo. Father Junipero Serra, a Franciscan missionary, came here in 1770 and established San Carlos Church, once known as the Royal Chapel. Father Junipero is buried in his church at Carmel, near by. The Spanish *presidio* or garrison at Monterey dates from 1778. Until the discovery of gold, Monterey was the Pacific Coast's richest and most important city. It fell into the hands of privateers for a short time in 1818. The United States took possession in 1846. The Constitution of California was framed in Sept., 1849, at Colton Hall, now the city hall. The first English newspaper on the Pacific Coast was published in Monterey. Robert Louis Stevenson, coming here to claim his bride, held a newspaper job in the city at \$2.00 a week. Monterey was incorporated in 1851. Pop. 1920, 5,479; 1930, 9,141.

**MONTEREY, BATTLE OF**, Sept. 21-24, 1846, an engagement of the MEXICAN WAR between Gen. Taylor with 6,700 Americans and a Mexican army of 3,000 regulars and 6,000 volunteers under Gen. Ampudia. On Aug. 19 Taylor, reinforced by about 3,000 volunteers from the southern states, began his march toward Mexico City. The army arrived before Monterey 30 days later, attacked on Aug. 21, and after three days' desperate battle captured the city. Ampudia was permitted to march out with the honors of war, and Taylor agreed to an armistice of eight weeks. The Mexican casualties were about 1,000; the American, nearly 500.

**MONTEREY PARK**, a residential and resort suburb 8 mi. east of Los Angeles, situated in Los Angeles Co. in southern California. Bus lines and the Pacific Electric Railway serve the city. Although it is mainly a residential city there are light industrial establishments. The vicinity has beautiful orange and walnut groves. Monterey Park is an incorporated city governed by a Council of five, elected by the people. Pop. 1920, 4,108; 1930, 6,406.

**MONTE ROSA**, a mountain of the Pennine Alps between 45° 56' N. lat. and 7° 52' E. long. Covered by glaciers, it is situated on the border between Switzerland and Italy, and with the exception of Mont Blanc, is the highest in the Alps. There are several outstanding peaks, the loftiest being the Dufour Spitze which towers to a height of 15,217 ft. The mountain is chiefly composed of gneiss, with some mica slate. It has been found profitable to mine gold, iron and copper.

**MONTERREY**, a city of Mexico, and capital of the state of Nuevo Leon, situated in the valley of the Santa Catarina River, at an altitude of 1,500 ft. above sea level, about 150 mi. southwest of Laredo, Tex. It is surrounded by lofty wooded mountains, one of which is called Saddle Mountain from its saddle-like formation. It is conspicuous as an American manufacturing center, and is one of the most modern cities in Mexico. Its chief industries are steel works, employing thousands of men, an extensive window glass factory, a brewery, flour mills, candy factories, smelters,

a cement plant, shoe and furniture manufacturing and many minor industries. Most of these plants are located east of the city, at the foot of Saddle Mountain. Power for street railways, lights and other purposes is supplied by an American company; and gas from wells in Texas, and an abundant supply of pure water contribute materially to the modern comforts of the city.

Among the buildings of interest are the Governor's Palace, built of red sandstone from the quarries at San Luis Potosi, at a cost of a million pesos, the federal building, the cathedral, several important Protestant churches, clubs, modern hotels and the ruins of the old Bishop's Palace *El Obispado Viejo*, in a nearby suburb. There are good schools, hospitals, and many beautiful plazas, bordered by trees and flowers. Monterrey was founded about 1560, and after being named a number of times, finally received its present name in 1569. Pop. 1921, 88,458; 1930, 136,101.

**MONTES, ISMAEL** (1861- ), Bolivian soldier and liberal statesman. He served in the house of deputies, but was defeated because of his liberal ideas. When the liberal revolution broke out in 1898, Montes took an active part and became minister of war in the cabinet of President José Manuel Pando. He served twice as president, 1904-1909 and 1913-1917. Because of his energy and numerous reforms, he is known in Bolivia as "the great president." His chief accomplishments were the building of a railroad from Oruro to Viacha, completing the line from La Paz to the Pacific; his encouragement of the application of scientific agriculture; the establishment of many primary schools; the conclusion of treaties with Brazil and Chile, settling long-standing disputes; and the establishment of civil marriage and religious tolerance.

**MONTESQUIEU, CHARLES LOUIS DE SECONDAT, BARON DE LA BRÈDE ET DE** (1689-1755), French writer and publicist, was born near Bordeaux, in Jan., 1689. Adopting the profession of law, but without much success, he abandoned it and turned to the pursuit of studies more in accord with his tastes. For a time he groped for his exact field and meanwhile, in 1721, published anonymously his *Lettres Persanes*, an exchange of imaginary letters between two Persians, each of whom gives his impressions of French institutions with vigor and frankness. The work had a remarkable success and in 1727 Montesquieu was elected to the French Academy on the strength of it. In 1734 he published his *Considérations sur les causes de la grandeur et de la décadence des Romains*. With this work Montesquieu had found his true field. He now gave himself up wholly to writing the book by which he is best known, *L'esprit des lois*, which appeared in 1748 and ran through 22 editions in 2 years. Montesquieu died in Paris, Feb. 10, 1755.

**MONTESSORI, MARIA** (1869- ), Italian educator, was born at Chiaravalle, near Ancona, in 1869, and educated at the University of Rome, where, in 1894, she was the first woman in Italy to take a degree in medicine. In 1898 she became principal of a school for defective children. Here she practiced the

methods of the Dr. Seguin with such notable success that she adapted the same principles in her work with normal children, and thus evolved the revolutionary MONTESSORI SYSTEM, which was welcomed and widely adopted in many parts of the world. The essential principles of her method are free discipline in the classroom, and sense training through special educational apparatus. Dr. Montessori opened her first "House of Childhood" in Rome in Jan. 1907, and the second in April. Her first book, *The Montessori Method*, was published in 1912. She lectured on pedagogical anthropology at the University of Rome, 1900-07, and was appointed Government inspector of schools in Italy in 1922.

**MONTESSORI SYSTEM**, an educational system developed by Dr. MARIA MONTESSORI, an Italian educator. Her successful experiments with feeble-minded children led her to apply her theories of education to normal children, and in 1907 she opened her first school in Rome. Her system is based on three main principles: 1. principle of individuality, 2. principle of freedom, 3. doctrine that the senses are bases of higher life of man and require cultivation in early years. Dr. Montessori held that a child attains his most complete realization of his possibilities by following his individual impulses and that he should have freedom to do so. Her schools attracted wide attention, and private schools based on her theories were established all over the world. In Switzerland public Montessori schools were established by law in 1911. The popularity of Montessori schools in the United States has died down, but their influence is clearly seen in present day teaching methods.

**MONTEVERDE, CLAUDIO GIOVANNI ANTONIO** (Monteverdi), (1567-1643), Italian music composer, was born at Cremona, probably on May 14 (being baptized May 15), 1567. In 1603 he was appointed capellmeister of St. Mark's, Venice. Although his works are now rarely heard, he holds a position of historical importance in the development of the opera and of the arts of harmony and of instrumentation. His opera *Orfeo*, produced in 1608, is the first significant labor in the operatic domain, while his instrumental innovations, such as the use of the tremolo, won him the title "father of instrumentation." He also was exceedingly active in upholding chordal music, combating the nearly exclusively contrapuntal practises of his contemporaries, and in freeing harmony from numerous pedantic shackles. Altogether he exercised a much more profound influence over the development of music than his half dozen operas, three volumes of church music, and several books of madrigals would indicate. He died at Venice, Nov. 29, 1643.

**MONTEVIDEO**, the capital, leading city and chief port of Uruguay. The city is situated on a small peninsula and a partially protected bay which make a natural harbor possible at this point on the coast. The site is also favorable for ocean steamers in that it is virtually at the outer end of the Plata estuary, 100 mi. below Buenos Aires, on the other



shore. In the bay is the landmark which gave the city its name: the Cerro, a smooth cone over 500 ft. high, crowned with a lighthouse and an old fort.

With fine drainage facilities Montevideo is a clean, healthful city, well-lighted and well-served by electric tramways. It has fine buildings, including an imposing cathedral, theaters, 150 mi. of well-paved avenues, open squares and attractive parks. Over \$40,000,000 have been expended on the harbor and port facilities which include 36 warehouses. The railway system of Uruguay has been developed with Montevideo as its focus, and nearly all of the ocean commerce of the country passes through this port. The small development of manufacturing which has taken place in Uruguay is mainly confined to Montevideo and is chiefly connected with the preparation of meat products. There are several large flour mills in the city.

The Spaniards built the port on the Cerro in 1717, and the first settlement of the town was made a few years later; in 1828 it became the capital of Uruguay. Est. pop. 1930, 600,000.

**MONTEZUMA II** (1466-1520), Mexican ruler, the leader of the Aztec Confederation at the time of Cortes's arrival, born in Mexico. He succeeded his uncle in 1502. He had been high priest before his election. Almost immediately afterward he set forth on wars of conquest which carried him south into Guatemala, Honduras and Nicaragua. It was he who established the military and cultural supremacy of the Aztecs over the other members of the Confederacy. He and his father, Montezuma I, are known as the two expansionists of the nation. Montezuma II established a rigid theocracy which made him much feared. In 1519, when Cortes arrived (see CORTES, HERNANDO), Montezuma II sent embassies to receive him and welcome him to Mexico City. Cortes, however, captured Montezuma and held him prisoner, governing the country through him as a mouthpiece. Montezuma II was stoned by his subjects and died on June 30, 1520. He was aristocratic, despotic and a luxury loving monarch.

**MONTEZUMA CASTLE**, a true cliff dwelling in Yavapai Co., central Arizona, was set aside as a national monument Dec. 8, 1906. The castle proper and many smaller structures are built in a cavity of a vertical cliff about 80 ft. above its base. The buildings cover about 40 ft. from top to bottom and probably housed over 300 people. They are in an excellent state of preservation despite the fact that the Apache Indians who occupy the valley have no traditions of their origin or of the people who inhabited them, indicating that they must be very old. The monument can be reached by an 80 mi. drive over a beautifully scenic road from Flagstaff, Ariz., on the Santa Fé system and National Park-to-Park Highway and also from Prescott, Ariz., 54 mi. distant.

**MONTFORT, SIMON DE**, Earl of Leicester (c. 1208-65), English statesman, the third son of Simon IV of Montfort, famous leader of the Albigensian Crusade, was born in France about 1208. In 1230

young Simon went to England and obtained from Henry III a re-grant of the hereditary earldom of Leicester, which had been taken from his family by King John. Attaching himself to Henry, Montfort rose rapidly to power, and in 1238 married the king's sister, Eleanor. He was appointed governor of the duchy of Gascony in 1248, but his inflexible severity as administrator earned him the enmity of the Gascon nobles, who succeeded in turning Henry against him. Montfort was forced to resign, and returned to England in 1252. The widening breach between himself and the king resulted in his joining the feudal opposition, and at the Mad Parliament of Oxford, 1258, he found himself the leader of this movement against the king. In 1263 Henry and his rebellious barons consented to submit their differences to Louis IX of France for arbitration. When Louis, in the "Mise of Amiens," decided in favor of the English king on all points, Montfort declared war on Henry and won a brilliant victory over him at the battle of Lewes, 1264. The king capitulated and under the terms of the "Mise of Lewes," handed over his government to a council of nine to be nominated by the Earls of Leicester and Gloucester and the Bishop of Worcester. Montfort's associates proved to be mere figureheads; he alone ruled England as virtual dictator. His iron hand cost him the support of some powerful barons, and to strengthen his position, he took the bold step upon which rests his chief claim to fame. Convening the celebrated Parliament of January 1265, he summoned not only the nobles, clergy and knights, but also two citizens from every borough, an innovation of prime importance in the development of the House of Commons. However, this move failed to buttress Montfort's power. His former allies had forsaken him; his fortunes were falling rapidly. With a small army he fled to Wales, but was pursued and overtaken by Prince Edward's forces, at whose hands he met defeat and death at the battle of Evesham, Aug. 4, 1265.

**MONTGOLFIER, JOSEPH MICHEL** (1740-1810), French inventor, was born at Vidalon-les-Annonay, Ardèche, in 1740. He studied mathematics, physics and mechanics, and on the death of his father succeeded, with his brother, Jacques Étienne Montgolfier (1745-99), to the former's paper factory. With the means which this factory placed in their hands, the brothers undertook experiments with balloons, and in 1783 built one of paper, raised by hot air. The ascension of this balloon created a great sensation. Montgolfier went to Paris at the outbreak of the Revolution where he became administrator of the Conservatory of Arts and a member of the Ministry of the Interior. In 1784 he collaborated with his brother in writing *Mémoire sur la machine aérostatique*, and also *Discours sur l'aérostas*, 1783, and *Les voyageurs aériens*, 1784. He died at Balaruc-les-Bains, Hérault, June 26, 1810.

**MONTGOMERY, RICHARD** (1736-75), American soldier, was born in Dublin County, Ireland, in 1736. He served in the British Army from 1756-

1772, taking part in various expeditions on the American continent, and on his retirement from the army bought an estate on the Hudson, and married the daughter of Robert R. Livingston. He was a delegate to the first provincial congress of New York, 1775, and became brigadier-general in the Continental Army, taking command of the Canadian expedition when Schuyler became ill. In the assault against Quebec on Dec. 31, 1775, Montgomery was killed.

**MONTGOMERY**, the capital of Alabama and the county seat of Montgomery Co., situated in the south central part of the state, on the Alabama River. The Louisville & Nashville, the Mobile & Ohio, the Atlantic Coast Line, the Seaboard Air Line, the Central of Georgia and the Western of Alabama railways, and bus-lines and river boats serve the city. In 1929 the various manufactures were valued approximately at \$21,000,000; the retail trade amounted to \$32,475,333. The city is located in the "black belt," a band of rich soil yielding crops of cotton, grain, vegetables and fruits. Samuel Dexter laid out the town in 1817, on the site of a former Indian village named Ecunchatty, calling it New Philadelphia. In 1819 the village was renamed in honor of Gen. Richard Montgomery and in 1837 was incorporated. Montgomery became the state capital in 1847. The Confederate capital was located here for a few months in 1861. In 1905 Montgomery received a new city charter. Pop. 1920, 43,464; 1930, 66,079.

**MONTH**, originally the time between two successive and similar phases of the Moon, such as from new moon to new moon, and thus equal to the SYNODIC PERIOD of revolution of the moon around the earth, or 29 days, 12 hours, 44 minutes, on the average. In our modern calendar the solar year is divided into twelve unequal months nearly one day longer on the average than the real lunar month.

**MONTI, VINCENZO** (1754-1828), Italian poet, was born in Fusignano, near Ravenna, Feb. 19, 1754. In 1779 he produced *Poesie*. His popular *Odes* were followed by two tragedies, *Aristodemo*, 1787, and *Galeotto Manfredi*, 1788. *Caio Gracco*, 1802, is considered his best drama. Monti is famous for reintroducing into Italian literature the "poetry of historical events." His neo-classical style received much admiration, finally winning him the coveted glory of poet-laureate. Monti died at Milan, Oct. 13, 1828.

**MONTICELLO**, the historic mansion and estate of THOMAS JEFFERSON, situated in Albemarle Co., Virginia, in the beautiful Piedmont region, 70 mi. northwest of Richmond and 3 mi. east of Charlottesville. Standing on the crest of a small hill, surrounded by handsome grounds, the house is a large one-story brick structure, built in the Palladian Doric order, with a monumental portico and a severely classical dome. Designed by Jefferson himself and built under his supervision, the mansion is one of the most picturesque examples of Colonial architecture. Monticello was first occupied by the third President in 1770, and it continued to be his home, except for short intervals, until his death in 1826. The graves of Jeffer-

son, his wife and their two daughters are on the estate.

About a decade after Jefferson's death, Monticello was purchased by Uriah P. Levy, an American naval officer (d. 1862), and was willed by him to the people of the United States. The estate was confiscated by the Confederacy during the Civil War, was claimed by various of Levy's relatives, but was finally recovered and admirably restored by Jefferson M. Levy, a nephew of the former owner. In 1915, yielding to a campaign begun chiefly by Mrs. Martin W. Littleton and greatly aided by the Virginia Legislature, Mr. Levy sold Monticello to the government for \$500,000. The mansion, now a government museum, is also the Virginia home for the Presidents.

**MONTLUÇON**, a manufacturing city of central France, situated on the Cher, department of Allier. A large modern quarter surrounds a medieval nucleus and old chateau. The principal industries are foundries and the manufacture of mirrors and automobile tires. Pop. 1931, 41,052.

**MONTMARTRE**, a hill in Paris (340 ft. above the Seine River) within the city walls, now occupied by *Arrondissement XVIII*. Once famous as a bohemian quarter, it is now the center of Paris night life, and as such is much visited by tourists. The church of Sacré-Coeur, a modern edifice, is on the summit of Montmartre.

**MONTMORENCY FALLS**, a cataract on the Montmorency River, near the city of Quebec, Canada. The waters of the river, having the velocity of a torrent, plunge over a precipice in a sheet 150 ft. wide and down 265 ft. to meet the St. Lawrence. The recoil is so great that at the foot of the falls a huge tower of spray forms, which in winter freezes, making an ice cone 50 ft. high. High cliffs and overhanging bushes add to the grandeur of the scene. On the upper level are four towers built to support a suspension bridge which collapsed many years ago. Montmorency Falls supplies water power for Quebec's electric plants.

**MONTPELIER**, the capital city of Vermont, county seat of Washington Co., 40 mi. southeast of Burlington, on the Winooski River. It is served by the Central Vermont and the Montpelier and Wells River railroads, motor buses and an airport. Situated in a granite region, amid beautiful Green Mountain scenery, Montpelier's quarrying and granite works lead over other industries. Montpelier is the birthplace of Admiral GEORGE DEWEY. Founded in 1780, by Jacob Davis and named after Montpellier, France, the town was settled seven years later, became the capital in 1805, and a city in 1894. Pop. 1920, 7,125; 1930, 7,837; 25% foreign-born.

**MONTPELIER**, the former home of JAMES MADISON, in Orange Co., Virginia, near MONTICELLO. The mansion stands above a terraced garden and consists of a central portion built in 1760 by Madison's father, and two equal wings added about 1809. Madison spent most of his life at Montpelier and is buried here with his wife.

**MONTPELLIER**, an old university city located in southern France 7 mi. from the Mediterranean at Cette, capital of the department of Hérault. Its schools of medicine and law were founded in the 12th century, and the university in the 13th. PETRARCH studied law and divinity here. Special courses are given for foreign students. The botanical garden which dates from the 16th century is the oldest in France. Montpellier was a center of Protestantism. In 1622 it was taken by Louis XIII after eight months of siege. A quiet southern town, it has many old buildings, a pleasant climate, and little important industry. AUGUSTE COMTE was born here. Pop. 1931, 86,924.

**MONTPELLIER, UNIVERSITY OF**, at Montpellier, Department of Hérault, southern France, is a state university especially renowned in the 12th-14th centuries for its medical school. Before 1150 this had gained a reputation second only to that of the SCHOOL OF SALERNO. To the medical school was added a faculty of law in 1160, largely through the efforts of the noted jurist, Placentinus of Bologna. A faculty of arts was later added, and in 1289 Pope Nicholas IV raised the institution to the full standing of a university. After the 14th century the medical school alone maintained its former high rank. All departments of the university were reorganized under Napoleon I. The number of students at Montpellier is about 1,500. In 1930 the rector was Jean Coulet.

**MONTREAL**, the largest city of Canada, situated in the south central part of Quebec on the island of Montreal at the junction of the Ottawa and St. Lawrence rivers. A thousand miles from the sea, Montreal is one of the largest grain shipping ports in America, having splendid elevators and all modern terminal facilities. Originally a village on the river bank, Montreal has gradually spread to an area of 50 sq. mi., across flat land to Mt. Royal, an eminence of 763 ft., which gave the city its present name. The sides of this mountain are now dotted with villas and coursed by driveways to a park of great beauty on the summit.

Montreal owes its importance to several very active geographic factors. The city is located on a navigable river 1,000 mi. inland at the head of ocean navigation and it is at the edge of the Canadian upland where water power is abundant. Here is the meeting-place for the lake, ocean and rail travel of the country. It is near the international boundary line between the United States and Canada and is the outlet of the rich hinterland of western Canada. However, among its handicaps can be listed a closed harbor in winter and increased ocean insurance rates.

Montreal is a city of churches, there being about 300, including the Anglican and Roman Catholic cathedrals. Several of the churches are famous for their architectural beauty or historical significance. Notre Dame Cathedral has twin towers 227 ft. high, Gothic outlines conspicuous from many parts of the city and seating accommodations for 10,000. The Cathedral of St. James is modeled after St. Peter's at Rome.

Christ Church Cathedral, Anglican, is of early English style.

The industries include the manufacture of footwear, clothing, cement, tobacco, iron and steel, machinery, rubber goods, confectionery and electric goods. Sugar refining and flour milling are carried on. The city is the center of the export and import trade of Canada and is the headquarters of the chief financial houses. The annual industrial output has been valued at more than \$450,000,000. Hydroelectric power is received from Shawinigan Falls, and Lachine, Cedar and Chambly rapids.

The headquarters of the Canadian National and the Canadian Pacific railways are at Montreal. The Great Lakes and St. Lawrence Railway forms a highway into the heart of North America. A bridge 2 mi. long, connecting Montreal with the south shore of the St. Lawrence, was opened in 1930. This structure provides four lanes for automobile traffic; tramway tracks are on each side of the roadway which is 37½ ft. wide. The Victoria Railway Bridge crossing the St. Lawrence was opened in 1860 and rebuilt in 1898-99. There is a two-span cantilever bridge at Lachine.

As an educational center Montreal ranks high among the cities of the continent. McGill University, chartered in 1821, now offers study in the arts, applied science, law, medicine, dentistry, pharmacy, agriculture, music and commerce. The University of Montreal has taken over the Montreal branch of Laval University of Quebec. Among the chief philanthropic institutions are the Gray Nuns' Hospital, founded in 1755, and the Hotel Dieu, established 1644.

In 1642 Maisonneuve and his party of armed religious enthusiasts founded a settlement on the site now known in Montreal as Custom House Square. Actual colonization began in 1653; grants were made, and a chain of houses was built to form a line of defence against Indian attacks. There were continuous struggles against the Iroquois Indians who were devastating the whole island. In 1722 the city was fortified with a bastioned wall. The British took the island in 1760, but since, except for the invasion in 1775 and 1776 from the American colonies, the history of the city has been peaceful. Montreal was the seat of government of Lower Canada until 1849, when it was superseded by Quebec.

The population in 1921 was 618,506. The census of 1931 reported 818,577 inhabitants, and in Greater Montreal, in which is included Lachine, La Salle, Longueuil, Montreal East, Montreal South, Montreal West, Hampstead, Mount Royal, Outremont, St. Lambert, St. Laurent, Ville St. Pierre, Verdun and Westmount, the population was estimated at over 1,176,000. About half of the population is of French descent; of the rest, the Irish inhabitants are more numerous than those of English and Scottish origin.

**MONTREAL, BATTLE OF**, Nov. 12, 1775, an engagement of the REVOLUTIONARY WAR which resulted in an American victory. While Gen. Washington was engaged in organizing and drilling the main body of the Revolutionary army, an invasion

of Canada was undertaken, largely in the expectation of persuading the Canadians to join the Rebel cause. Gen. Richard Montgomery, leading the expedition because of the illness of his superior, Gen. Schuyler, set out from Ticonderoga in October with 2,000 men. Moving down Lake Champlain, his troops took Chambly with ease, and succeeded at St. John after a long siege. At Montreal Montgomery encountered and dislodged Gen. Carleton with an inferior British force. The next objective was Quebec. *See* QUEBEC, BATTLE OF.

**MONTREAL UNIVERSITY**, at Montreal, P.Q., Canada, a coeducational institution founded in 1878, and incorporated under its present name in 1920. It comprises faculties of Pure Science and of Letters, schools of Social, Economical and Political Sciences, Dentistry, Music and Philosophy, and a Radium Institute. Montreal had an endowment in 1931 of \$2,400,000, and the library contained 125,000 volumes. In 1930 there were 7,268 students, and a faculty of 623 headed by Mgr. A. V. J. PIERRE.

**MONTREUX**, a city and health resort of Switzerland in the canton of Vaud, on the Lake of Geneva. Montreux proper is merely a group of houses around a church but the name is a collective one for a large number of scattered villages along Lake Geneva and reaching back to the mountains. The climate is mild and many convalescents spend autumn and winter there. Montreux is called the Swiss Nice. It has many hotels and boarding-houses and a Kurhaus for plays and concerts. Pop. 1930, 18,407.

**MONTROSE**, a city in southwestern Colorado, the county seat of Montrose Co. It is situated on the Uncompahgre River, 325 mi. southwest of Denver and is served by bus lines, airplanes and the Denver and Rio Grande Western Railroad. The city lies in a region irrigated by the Gunnison Tunnel reclamation project. The principal crops are grain, sugar beets, onions and potatoes. It is also a center for the cattle and sheep-raising industry of the western end of the county. Coal, radium, vanadium and uranium are found in this region. Montrose was founded and incorporated in 1882. It is a gateway to the Rocky Mountains and is surrounded by splendid scenery. The home of the Indian chief Ouray and his wife, Chipeta, is an interesting landmark. Pop. 1920, 3,581; 1930, 3,566.

**MONTS, SIEUR DE** (Pierre du Gast) (1560-1611), French adventurer and colonizer of New France. Protestant by conversion but a friend of Henry IV, in 1603 he was made governor of the newly formed French Company of Canada, which possessed a monopoly of the fur trade between latitudes 40° and 50°, and therefor was bound in return to settle one hundred colonists annually. With De Monts in April 1604, CHAMPLAIN and a young nobleman, Biencourt de Poutrincourt, with a well-selected company of artisans and yeomen set sail. After coasting along Nova Scotia the company landed on St. Croix Island, June 25, where they wintered. Scurvy and other sufferings reduced the company by two-fifths and the

settlement was reconstructed at Port Royal in the spring and summer. De Monts returned to France, leaving 45 colonists to winter in Acadia; Poutrincourt returned in June 1606, with supplies and additional settlers. De Monts' monopoly of the fur trade meanwhile was assailed and revoked; when the news reached Port Royal in the spring of 1607, the colony, not strong enough to trust to its own resources, was abandoned and the settlers returned to France. De Monts, convinced that the fur trade might be profitable even without a monopoly, sponsored Champlain's expedition of 1608 which resulted in the founding of Quebec on a permanent basis. After the assassination of Henry IV, De Monts was without friends at court, and died penniless at Paris in 1611.

**MONT-SAINT-MICHEL**, an isolated rock off the west coast of France in the department of La Manche. It is joined to the mainland by a causeway and crowned by a picturesque and historic fortress abbey which is one of the most celebrated goals for visitors in the country. The Benedictine abbey was founded in the 8th century and the present buildings date from the 11th to 13th centuries, the encircling ramparts from the 15th. The most notable section is the early 13th century structure called *La Merveille*, with admirable cloisters and vaulted halls. The church, begun in 1020, has been much modified. Made state property during the Revolution, since 1874 the abbey has been classified as a historical monument by the French government. A little village is situated on the rock. Pop. 1931, 247.

**MONTSERRAT**, an island in the West Indies, one of the British group known as the LEEWARD ISLANDS. It is 12 mi. long, 8 mi. wide and has an area of 32 sq. mi. The island comprises a range of volcanic hills rising from the Caribbean Sea to an elevation of about 3,000 ft. The summits of these hills are forest-clad. In the depressions cotton is extensively cultivated and products include sugar, bay oil, lime juice and onions. Cattle are also reared. Plymouth is the capital and largest town. MONTSERRAT was discovered by Columbus in 1493 and was named by him Monserrado. The British occupied it in 1632. From then till 1784, since which time it has been a British possession, it changed hands several times between Great Britain and France. Pop. 1930, 12,196.

**MONTT, MANUEL** (1809-1880), Chilean statesman, born of poor parents in Petorca, on Sept. 5, 1809. He studied in the National Institute and from 1835 to 1840 served as its rector. In the latter year he was elected to the chamber of deputies and was almost immediately made its president. Under Pres. Bulnes he was minister of the interior, fostering many salutary reforms. Later he occupied high posts in the department of justice. In the midst of a revolution in 1851 Montt was elected president of the republic, serving for two terms until 1861, during which time the railroad from Valparaiso to Santiago was built, telegraph wires stretched and roads constructed. Public buildings also were begun or completed and several

banks established. Montt abolished the tithe and the entailed estates and undertook the colonization of the south. More than 500 schools were founded in his decade. In 1855 a civil code was adopted. The "decade of Montt" is regarded as one of the most progressive in the history of the republic. From 1861 until his death in Santiago in 1880, Montt was a justice of the supreme court.

**MOOD**, a category of the verb denoting contingency of action or state. INDO-EUROPEAN is conventionally regarded as having had five: indicative, subjunctive, optative, injunctive and imperative, the injunctive only in INDO-IRANIAN, and the subjunctive and optative combined, except in Indo-Iranian and GREEK, into a subjunctive.

The indicative expresses a fact or something regarded as a fact, "I live, I do." The subjunctive has two main forces: voluntative, denoting the speaker's desire, "may you be happy," and dubitative, "I wonder whether you be happy," the frequent development of the subjunctive into the future (*see* TENSE) being based on the former. The optative is either potential, "you might be happy," or prescriptive, "you should be happy." The injunctive, outwardly a mere aorist or imperfect (*see* ASPECT, TENSE) without an augment, is scarcely distinguishable in force from the subjunctive, but is used especially in prohibitions. The imperative, like the vocative of the noun (*see* CASE), stands apart. Except in the second person singular, it is a composite of other moods (SANSKRIT, for example, having subjunctives for the first persons, and injunctives for the rest), this second singular being simply the BASE, sometimes with affixed particles. While in French and German the subjunctive denotes, among other uses, a statement as to the truth of which nothing is affirmed, *il soit venu, er sei gekommen*, "(it is alleged, whether truly or falsely, that) he has come," in English the mood is moribund, with consequent loss of power to express a delicate shade of meaning, for the potential force of "if this be true" is not the same as the bluntly factual force of "if this is true."

SEMITIC has six moods: indicative, subjunctive, apocopated or jussive, energetic, cohortative and imperative. The apocopated implies a command or prohibition less strong than that connoted by the imperative; the energetic is employed chiefly in assertions; and the cohortative is found especially in exhortations, "be not happy!; verily, we shall be happy; let us be happy!" L. H. G.

**MOODY, DWIGHT LYMAN** (1837-99), American evangelist, was born at Northfield, Mass., on Feb. 5, 1837. Leaving school when 13, he went to work at odd jobs. At 17 he was employed in a Boston shoe store owned by two uncles. He attended a Congregational church there, was converted, and admitted to full membership in 1856. He went to Chicago, found work as a shoe salesman, and became financially successful. Moody began his long life of social welfare work with the establishment of the North Market Sabbath School in 1858; he gave up business for inde-

pendent missionary work in 1860. Allying himself with the Y.M.C.A., during the Civil War he engaged in the movement for the comfort of soldiers at the front, and at the same time carried on his work in Chicago. As president of the Y.M.C.A. in Chicago he built in 1866 the first structure exclusively for Y.M.C.A. purposes in the United States.

In 1867, 1870 and 1873-75 Moody was in England, on the third visit embarking on a series of evangelistic services which took Scotland, Ireland and England by storm. On this Moody was accompanied by IMA D. SANKEY, organist and singer. From 1875 to 1881 he conducted meetings in the larger cities of the United States with great success. In 1879 he founded Northfield Seminary for girls and in 1881 Mount Hermon School for boys, at both of which practical training centered about a knowledge of the Bible. A second prolonged visit in the British Isles began in 1881, ending in 1884, and the last visit occurred in 1891-92. Between the two final visits to England Moody had conducted his campaign in all parts of the United States and Canada, had worked effectively for the spiritual education of college students, and had secured the enlistment of college-trained men and women as missionaries in foreign countries. Between 1891-99 he preached throughout the United States to many thousands of persons. Falling ill in Nov. 1899, he returned to Northfield, and died on Dec. 22.

**MOODY, HELEN NEWINGTON WILLS** (1905- ), American tennis player, was born at Centerville, Cal., Oct. 6, 1905. She graduated from the University of California in 1927. Her hard drives and service, fashioned after the style of men players, coupled with an imperturbable presence on the courts, quickly brought her to the front of women's tennis in the United States. She won the national singles championship in the years 1923-31, excepting 1926, when she was ill, and 1930, and won the French and English (Wimbledon) championships in 1927, 1928, 1929, and 1932. At Cannes in 1926 she was defeated by Suzanne Lenglen of France. In 1929 she married Frederick S. Moody, Jr., of San Francisco.

**MOODY, WILLIAM VAUGHN** (1869-1910), American poet and dramatist, was born at Spencer, Ind., July 8, 1869. He worked his way through Harvard and for several years afterward was on the faculty of the University of Chicago. His two plays, *The Great Divide* and *The Faith Healer*, were very successful. The rest of his output was verse, of which there were several volumes of collected poems and two poetic dramas, *The Masque of Judgment* and *The Fire-Bringers*. Moody's lyric gift was fine, rich and varied, and he had thorough command of technique. High idealism and spiritual significance marked the poet's work. The intellectual appeal of his verse is as strong as its emotional power. Moody died Oct. 17, 1910, at Colorado Springs, Colo.

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**MOON**, the body which revolves around the earth in 27 days, 7 hours, 43 minutes, at a mean distance of

239,000 miles. Owing to the ellipticity of the orbit the actual distance varies between 221,000 and 253,000 miles. Due to the fact that the orbit of the moon around the earth, and the moon's speed in it are about 400 and 30 times smaller respectively than the corresponding quantities for the orbit of the earth around the sun, the actual path of the moon in space is always concave toward the sun. The moon is a dark body shining only by reflected light from the sun, and thus passes through its phases from new moon to full moon and back. While its fully illuminated half is always turned toward the sun, this passes through all different orientations with respect to the earth during one complete turn around the earth.

The period of revolution around the earth, in relation to the stars, is as given above. Since, however, the earth revolves around the sun in the same direction, it takes the moon longer to reach the same position with reference to both sun and earth. Hence the time between corresponding phases of the moon is longer, and measures 29 days, 12 hours, 44 minutes. The first period is called the sidereal month, the second the synodic month. It is the latter that forms the basis of our CALENDAR. The moon rotates on its axis in exactly the same time as it takes to go around the earth and therefore always turns the same side toward us. But as its motion is not entirely uniform, owing to the ellipticity of the orbit and various other causes, it appears to sway to and fro slightly so that 59% of its surface becomes visible at one time or another; the remaining 41% is forever hidden from our view.

The moon has a diameter of 2160 miles, is 49 times smaller in volume than the earth and 81 times smaller in mass, and is composed of materials that must be similar to the rocks on the earth's surface. Viewed through a telescope or even a field glass, the mountainous structure of the moon is very conspicuous, its principal features being the peculiar shape of some mountains, which seem to form huge circular walls, 100 miles or more in diameter. It is believed that these originated either by volcanic eruptions or by the impact of swarms of meteors. The moon has no atmosphere, and its surface seems to be composed of brown or dark slate-colored material since it reflects only about 7% of the sunlight falling upon it. The temperature on its surface may be as high as 150° during the period of sunshine but falls to at least 300 below zero during the lunar night.

To the earth, the moon is of especial importance because of its influence in raising TIDES. W. J. L.

**MOONEY, JAMES** (1861-1921), American ethnologist, was born at Richmond, Ind., Feb. 10, 1861. He was educated in the public schools and in 1879-85, while working in the office of a newspaper, began the Indian studies which later became his life work. In 1885 he became associated with the Bureau of American Ethnology at Washington, D.C., for which he conducted field investigations among the southwestern Indians, particularly the Cherokees and tribes of the Great Plains. He compiled a tribal list con-

taining 3,000 titles, discovered the Cherokee ritual, and studied the ghost dance. His publications include *Myths of the Cherokees* and *Siouan tribes of the East*. Mooney died Dec. 22, 1921.

**MOON-FLOWER** (*Calonyction aculeatum*), a twining perennial herb of the morning-glory family, widely grown for its handsome night-blooming flowers. It is a native of tropical America with numerous fragrant large-flowered varieties in cultivation. The smooth stem, which exudes a milky juice, grows 10 to 20 ft. high bearing large heart-shaped leaves and white salverform flowers, 3 to 6 in. long and sometimes 6 in. broad. An allied species (*C. muricatum*) with smaller purple flowers is also cultivated.

**MOONSEED** (*Menispermum canadense*), a climbing woody vine of the moonseed family (*Menispermaceæ*), called also yellow parilla. It grows in woods along streams from Quebec to Georgia and westward to Nebraska and Arkansas. The stem, 6 to 12 ft. long, climbs over bushes and walls bearing broadly oval, heart-shaped leaves, loose clusters of small white flowers and bluish-black stone fruits resembling small grapes.

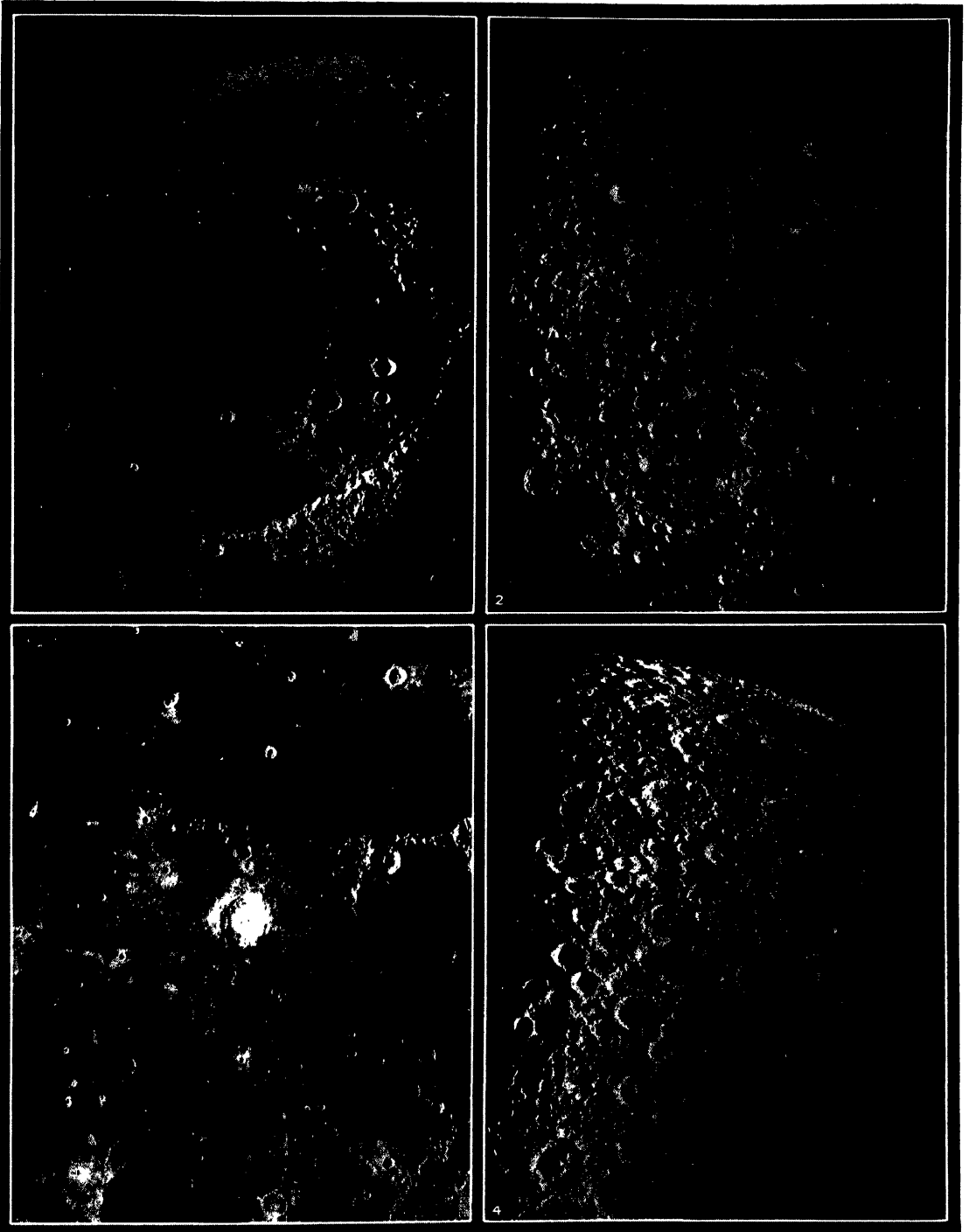
**MOONSTONE**, a translucent form of some of the FELDSPAR minerals, used as a semiprecious stone. The charm of moonstones resides in a peculiar chatoyant or opalescent effect, a pale bluish-white internal luminosity resembling moonlight. This is best shown when the stones are cut cabochon. ALBITE and OLIGOCLASE, and especially ORTHOCLASE, are found in this form. Feldspars are important constituents of IGNEOUS Rocks but gem varieties are comparatively rare. Moonstones are found in veins and cavities in granites and granitoid rocks, as near St. Gothard, Switzerland; others come from Elba and Ceylon. See also PLAGIOCLASE; GEM STONES; MINERALOGY.

**MOON SYSTEM:** Printing for the blind. See BLIND, CARE AND WELFARE OF.

**MOONWORT**, the name generally given to a numerous genus (*Botrychium*) of ferns of the adder's-tongue family. There are about 40 species distributed very widely throughout the world, about one-third of which occur in the United States and Canada. They are fleshy plants with stout rootstocks bearing a single (sometimes 2 or 3) erect, more or less deeply cut or divided leaves and a long-stalked fruiting spike composed of many globular sporangia producing an abundance of yellow spores. Several species, as the small moonwort or grape-fern (*B. simplex*) and the moon-fern (*B. Lunaria*), are cosmopolitan. The Virginia grape-fern (*B. virginianum*), with large, much-dissected leaves, is common in rich woods from Labrador to British Columbia and southward to Mexico.

**MOOR**, a term little used in America, which in England and Scotland signifies a rugged, barren, lowland or upland tract largely covered with heather growing in a sponge of peaty soil. When qualified, as in "sedge-moor" or "meadow-moor," it applies to low-lying, peatless salt marshes, fresh-water swamps, or fens. Such bleak elevated plateaus, crested with

# MOON



COURTESY MT. WILSON OBSERVATORY

## THE CRATERS OF THE MOON

1. Moon's surface showing craters thought to be similar to earth's volcanos. 2. Southern portion of the moon.  
3. The crater Copernicus. 4. Southern portion of the moon at last quarter.





granite peaks, or tors as are represented by Dartmoor, Exmoor, and other famous British heaths, are rendered essentially wet regions by the underlying carpet of rain-holding peat moss. In parts they are covered by an expanse of treacherous peat bogs. In recent years considerable portions of both Exmoor and Dartmoor have been successfully cultivated. *See* FEN.

**MOORE, CLEMENT CLARKE** (1779-1863), American poet and educator, was born in New York City, July 15, 1779. He was graduated from Columbia College. The popular poem, beginning "'Twas the night before Christmas," was written for his own children in 1822. From 1821-50 he was professor of Biblical learning in the General Theological Seminary, and gave the ground upon which it now stands. Among Moore's publications are a Hebrew and English lexicon and *Poems*. He died at Newport, R.I., July 10, 1863.

**MOORE, GEORGE** (1852- ), Irish writer, was born at Moore Hall, County Mayo, Feb. 24, 1852. He was privately educated, and at 18 went to Paris to study painting. For several years he lived in the atmosphere of the studio and the *café*, the intimate friend of the chief French artists of the '70s. He abandoned painting, and turning to verse issued *Flowers of Passion* in 1878 and *Pagan Poems* in 1882. But his real field was that of the novel. Moore returned to London in 1883, and two years later published *A Mummer's Wife*, a realistic novel avowedly more French than English in style and treatment. His total break with conventional Victorianism was effected in the three outstanding novels published between 1894-1901, *Esther Waters*, *Evelyn Innes* and *Sister Teresa*. In 1901 Moore returned to Ireland and for 10 years identified himself with the Irish Revival. Autobiographical material flowed from him richly, in *Confessions of a Young Man*, 1888, *Memoirs of My Dead Life*, 1906, *Hail and Farewell*, 1911-14, *Avowals*, 1919-26, and *Conversations in Ebury Street*, 1924, works containing some of Moore's most exquisite prose. Many critics consider *Heloise and Abelard*, 1921, his masterpiece, though others award this distinction to *The Brook Kerith*, 1916. Among Moore's other works are *Daphnis and Chloe*, 1924, two notable dramas, *The Making of an Immortal*, 1927, and *The Passing of the Essenes*, 1930, and the pagan *Aphrodite in Aulis*, 1931.

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**MOORE, GEORGE FOOT** (1851-1931), American clergyman and Biblical scholar, was born in West Chester, Pa., Oct. 15, 1851. He graduated from Yale in 1872, and from Union Theological Seminary five years later. From 1878-83 he was a Presbyterian minister at Zanesville, O. In 1883 he became Hitchcock Professor of Hebrew Language and Literature at Andover Theological Seminary and was made president of the institution in 1890. In 1902 Moore went to Harvard, where two years later he became Frothingham Professor of the History of Religions. He was a

Biblical scholar of distinction and is best known for his *History of Religions*, 1913-19, and his *Judaism in the First Century of the Christian Era*, 1927. Moore died at Cambridge, Mass., May 16, 1931.

**MOORE, SIR JOHN** (1761-1809), British general was born in Glasgow, Scotland, Nov. 13, 1761. He served in Nova Scotia during the American Revolution, fought in Corsica (1793-94) under Nelson and Eliot, and in Ireland in 1797 under Abercromby. In 1798 he became a major general. In July 1808 he was appointed second in command in Portugal under Sir Henry Burrard against the French forces of Napoleon and in September of that year he became commander-in-chief. In November he was forced by the French to retreat 250 mi. to Corunna where a victory was won by the English. Moore was killed during the battle, Jan. 16, 1809.

**MOORE, JOHN BASSETT** (1860- ), American jurist, was born at Smyrna, Del., Dec. 3, 1860. He was admitted to the bar in 1883. In 1886 he was appointed third assistant Secretary of State. He served as secretary to the Conference on Samoan Affairs in 1887 and held a similar post in 1887-88 on the Conference of North American Fisheries. In 1891 he became professor of international law and diplomacy at Columbia University. He was assistant Secretary of State during the war with Spain in 1898, and was active in arranging the peace terms at Paris. In 1921 he was appointed a judge of the Permanent Court of International Justice at The Hague, but resigned in 1928 to devote himself to historical research. In 1929 he published two volumes of the results of his studies, under the title *International Adjudications, Ancient and Modern*.

**MOORE, THOMAS** (1779-1852), Irish poet, was born at Dublin, May 28, 1779. He was educated at Trinity College, Dublin, and began his career in London, where he published his translation of Anacreon's odes in 1800. An engagement, begun in 1807, after travel in Canada and the United States, was made by Moore to furnish words to music by Sir John Stevenson. This project resulted in *Irish Melodies*, which includes some of Moore's loveliest songs; and it provided the poet with an income of £500 for 25 years. The series of *Sacred Songs* was also undertaken with Stevenson. *Lalla Rookh*, published in 1817, proved very successful, and after a trip to Europe Moore wrote several memoirs, the best known being that of EDWARD FITZGERALD. His fame, however, rests mainly upon a few of his lyrics, including *The Last Rose of Summer*, *The Harp that once through Tara's Halls* and *Oh Breathe not his Name!* Moore was a friend of Lord Byron's, and wrote his life. He died at Sloperton, near London, Feb. 25, 1852.

**MOORE, THOMAS STURGE** (1870- ), English writer and artist, was born Mar. 4, 1870, at Hastings. An art critic of note and an accomplished wood engraver, he published poetry, essays and studies of various artists, including Albrecht Dürer. Among Moore's works are *Vinedresser and Other Poems*

1899, a play entitled *Absalom, The Little School, Marianne, Art and Life and Mystery and Tragedy*.

**MOORESVILLE**, a city of Iredell Co., western North Carolina, situated in a dairying and farming region, 28 mi. north of Charlotte. It is served by the Southern Railroad. The chief local manufactures are cotton goods, flour, creamery products, lumber, furniture and other wood products. Pop. 1920, 4,315; 1930, 5,619.

**MOORHEAD**, a city in western Minnesota, the county seat of Clay Co., situated on the Red River across from Fargo, North Dakota. Bus and truck lines and the main transcontinental lines, as well as branch lines, of the Great Northern and the Northern Pacific railroads serve the city. Moorhead is a distributing market for dairy and farm produce, especially potatoes. The city has awning factories, bottling works and sheet metal products shops. Splendid oak lumber grows on the river banks. It is the seat of CONCORDIA COLLEGE and a State Teachers College. Moorhead was founded in 1871 and incorporated in 1881. Pop. 1920, 5,720; 1930, 7,651.

**MOOR HEN** (*Gallinula chloropus*), species of gallinule, one of the most common Old World aquatic birds, inhabiting reedy and bushy marshes widely throughout Europe, Asia and Africa. It is about the size of a small bantam, with chiefly dark slaty plumage and a red frontal plate at the base of the bill. The moor hen has a loud call note, and feeds mainly upon worms, insects, grass and seeds, though sometimes destroying the young of other birds; it nests usually among aquatic plants but also in trees, laying 7 to 9 buffish-white, speckled eggs.

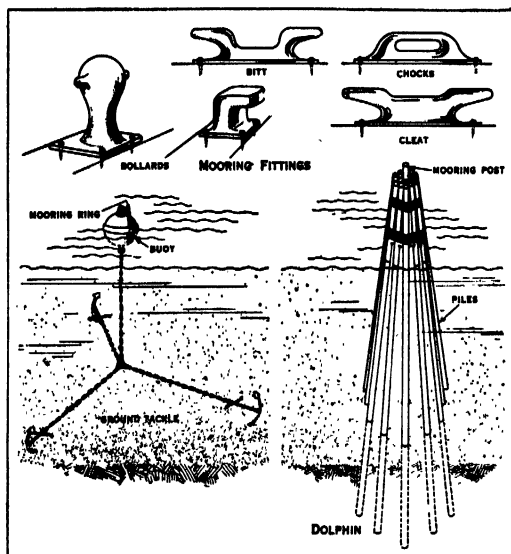
**MOORING MAST**, a mast or tower to which an AIRSHIP is moored or anchored at AIRPORTS. The top of the mast carries a cup which is free to revolve about a vertical axis and is mounted on a ram provided with a shock absorbing mechanism. The ram may also be mounted on gimbals, permitting about 30° inclination from the vertical during mooring, but it is rigidly locked in position when the mooring is completed. In anchoring an airship, a pendulated steel cone carried on the nose of the ship is drawn by the mooring cable into the masthead cup and locked there by spring latches. Mooring masts are of the "high," and the "stub" types. With the latter, the ship's stern is carried on a car running on a circular track around the mast.

**MOORINGS**, devices for securing vessels in place. On wharves and the like, mooring lines are attached to "bollards," mooring posts, "bitts" or "cleats." In some regular anchorages, permanent moorings are provided in the form of ground tackle; or anchors set in the bottom with buoys carrying chain to the surface to mark the location; or pile clusters called "dolphins." As considerable space is required by a ship swinging in a full circle around a bow mooring bow and stern moorings are sometimes provided. (See also WHARVES; HARBORS; PORTS.) F. R. H.

**MOORS**, the name loosely applied to the peoples of northwestern Africa. They were absorbed by the

Vandal kingdom in the 5th century, nominally subdued by Justinian in the 6th, and conquered by the Arabs in the 7th century. Early in the 8th century they crossed into Spain and speedily conquered that country. Moorish civilization in Spain reached a very high level, both cultural and material. A great library was established at Cordova, the capital; Toledo had a university famous throughout Europe. A new type of architecture was developed. Industry flourished; agriculture was stimulated by irrigation and the introduction of new crops. The Moorish régime in Spain ended with the fall of Granada in 1492.

**MOOSE** (*Alces americana*), largest of the deer tribe, a large Alaskan bull standing almost 8 ft. at



MOORINGS AND MOORING FITTINGS

the withers and weighing 1,800 lbs. Its almost identical European counterpart is known as the elk. The moose is certainly the homeliest of all deer, with lanky, awkward legs, flat horns; horselike, pendulous, hairy muzzle; high shoulders and sloping hind quarters. Yet a moose can outrun most horses and can move through thick brush so silently that it cannot be heard even at a short distance.

The spread of the antlers, which grow new each year, is enormous, sometimes reaching 80 inches. In winter the coat of hair is blackish brown above and lighter on the belly and lower legs; the summer coat is lighter and usually grayer. The cow moose, about three-fourths the size of the bull, has no antlers. The young, one the first season and usually two thereafter, are born late in May.

Moose are found widely throughout Canada, sparingly in the United States in the border states as far west as Wyoming, and also in Alaska. In the United States they are carefully protected by game laws. Moose browse on low bushes and especially enjoy

water plants of the shallow northern lakes and ponds. They swim easily and are frequently seen crossing lakes sometimes of considerable size. One of the shyest of forest animals, they lose much of their timidity during the rutting season in late autumn, when the bulls are often decoyed by hunters who imitate the animal's call on trumpets of birchbark.

A. R. F.

**MOOSE, LOYAL ORDER OF**, a large fraternal society in the United States, organized in 1888 at Louisville, Ky., by Dr. J. H. Wilson. The society pays sick and funeral benefits, and supports a farm home and vocational school at Mooseheart, Ill. A supreme lodge, with headquarters at Mooseheart, governs the widely scattered lodges, which in 1930 numbered 6,591,780 members. Members may enjoy the advantages of brotherhood without obligation to share in the insurance enterprises of the society. Since its inception James J. Davis, former U.S. Secretary of Labor, has occupied a prominent position in the society's activities and has served as Director General.

**MOOSE JAW**, the third largest city of Saskatchewan, Canada, situated at an altitude of 1,778 ft., on the Moose Jaw River, 398 mi. west of Winnipeg, and 47 mi. southwest of Regina. Served by the Canadian Pacific and Canadian National railroads, and by 12 radiating branch lines, it is important largely because of its transportation facilities which serve a rich agricultural area. There are great grain elevators, stockyards, iron works, oil refineries, agricultural implement factories and flour and lumber mills among the industrial plants. Moose Jaw is a substantially built city with numerous schools and colleges, churches, public buildings, an airport and parks. Pop. 1921, 19,285; 1931, 21,299.

**MOOSEWOOD**, a name given to a small species of maple (*Acer pennsylvanicum*), called also striped or goose-foot maple. It is found in damp rocky woods from Quebec to Wisconsin, and southward in the Appalachians to Georgia. The tree grows sometimes 40 ft. high, but is usually much smaller, with a short trunk and upright branches striped with broad whitish lines. The bright-yellow flowers, borne in long drooping clusters, appear after the leaves are grown. Leatherwood (*Dirca palustris*) is also called moosewood.

**MOQUELUMNAN**, a North American Indian linguistic stock, also known as Miwok.

**MORAINE**, rock-waste or **DRIFT** transported by a glacier in, on, and under the ice. Angular debris streaks the margins, and in trunk glaciers, the center, of the icestream, forming lateral and medial moraines. Heavily scratched and polished material, alternately pushed and dropped over bedrock beneath the ice, makes ground-moraine. At the melting icefront, boulders, gravels, and fine rock-flour unite in an unstratified jumble called the terminal moraine.

Morainal deposits by ancient glaciers, such as that which once covered the northern United States, sheeted vast areas with ground-moraine. This **BOULDER CLAY**, or **TILL** makes good or bad soil, as stony or fine con-

stituents predominate. The "backbone" of Long Island and of Cape Cod is terminal moraine.

**MORALE**, the state of mind of a military organization or command with reference to loyalty, discipline, cheerfulness, tenacity, initiative, resourcefulness, enthusiasm and kindred qualities. It is usually referred to as high or low, depending upon whether the state of mind of the command as a whole prompts it to a ready and willing, or a contrary acceptance of conditions and performance of tasks. It is reflected in an anxiety on the part of the great majority to serve the common good, to perform to the limit of capacity, to meet demands and to succeed. It is the imponderable factor which can outweigh a shortage of soldiers, bayonets, and food, and usually does so in the proportion, as stated by Napoleon, of three to one. Morale is not of necessity raised by victory or lowered by defeat. It is affected by the myriad factors which influence the lives and actions of the individual man. With attention to shelter, food and entertainment, morale can be improved by the ordinary commander. It is perfected by the born leader.

**MORALITIES** or **MORALITY PLAYS**, a type of medieval drama especially popular in France and England in the 15th-16th centuries, consisting of allegorical representations of the conflict between good and evil. Its characters were abstractions, such as justice, sin, good deeds, fraud, charity, riches and death. Virtue, in the morality plays, was assured of ultimate victory over evil. A favorite character was the Vice, usually portrayed as a clown who teased the devil. Moralities were acted in England well on into the Elizabethan age and were an important stepping-stone from the purely religious to the genuinely secular drama. Of all moralities the most memorable is *Everyman*, revived in 1903 by the Ben Greet Players. Others of note are Skelton's *Magnyfycence* and Wever's *Lusty Juventus*. See also **FRENCH DRAMA**; **ENGLISH DRAMA**.

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**MORAN, THOMAS** (1837-1926), American painter and etcher, was born in Lancashire, England, Jan. 12, 1837. Brought to the United States in childhood, he began his art career as a wood engraver in Philadelphia, spending his leisure hours painting in water color and oils. From 1866 to 1871 he studied in France, Italy and Germany. Returning to America in 1871, he joined the exploring expedition to the Yellowstone country, making sketches for his two great works, *The Great Canyon of the Yellowstone* and *The Chasm of the Colorado*, now in the Capitol at Washington. He settled in New York and became famous as a water color painter and as an etcher. He was elected to the National Academy in 1884. Moran died at Santa Barbara, Cal., Aug. 26, 1926.

**MORAND, PAUL** (1888- ), French writer, was born in Russia, Mar. 13, 1888, and educated at Oxford University, England. He was an ambassadorial secretary at London, Rome and Madrid. Among his

works are *Ouvert la Nuit*, 1922, and *Ferme la Nuit*, 1923, a volume of rhythmic prose, entitled *Feuilles de temperature*, 1920, *Lewis et Irene*, 1924, and *New York*, translated into English, 1930.

**MORAN PARK**, a state park, 4,000 acres in extent, on Orcas Island, San Juan Co., in northwestern Washington. There are several beautiful lakes and from the summit of Mt. Constitution, a 2,400 ft. elevation, a magnificent view of San Juan Island and the adjacent mainland is obtained.

**MORATIN, LEANDRO FERNANDEZ DE** (1760-1828), Spanish dramatist, was born at Madrid, Mar. 10, 1760. In his 18th year Moratin won a prize from the Spanish Academy, subsequently being given the post of official translator. *MOLIÈRE* was his ideal, although his witty and lively plays, *The Maid's Consent* and *The Hypocritical Woman*, are more in the style of CARLO GOLDONI. He accepted a post from Joseph Bonaparte, and after his fall went to France, where he died insane at Paris, June 21, 1828.

**MORATORIUM**, the authorization by a creditor to a debtor to postpone the payment of debts or obligations for a specified period of time. While any individual or corporation may authorize a moratorium, it usually takes the form of governmental authorization, and sometimes involves the suspension of specie payments. It is chiefly used commercially in connection with bank deposits, drafts and bills of exchange. During the World War, moratoria were generally declared by European governments. The post-war depression took the moratorium more actively into the field of international finance. A moratorium authorized by the Allied Powers relieved Germany of reparations payments under the Young Plan for one year. This step toward the solution of the problem of post-war debt settlements may lead to further moratoria in connection with international debt problems in the future.

**MORAVA**, the largest river of southern Yugoslavia. It is formed by two headstreams, the Southern and Western Moravas, which unite 33 mi. northwest of Nish. The Western Morava rises in northwest Serbia and flows eastward, meeting the southern headstream near Krushevat. From here on the Morava flows directly northward, reaching the Danube at Semendria, midway between Belgrade and the Rumanian boundary, after following a total course of about 300 mi. The chief tributaries of the Morava are the Ibar, Toplitza, NISHAVA, Yablanitza and Vlasina. The valley through which the Morava flows is one of the most fertile of Serbia, but it is navigable only by small craft.

**MORAVIA** (Czech *Morava*), a province of Czechoslovakia, bounded on the north and northeast by Lower Silesia on the southeast by Slovakia, on the south by Lower Austria and on the west by Bohemia, area 8,616 sq. mi. The Bohemian-Moravian Range marks the western frontier, the East Sudetic Mountains and other ranges, the northeast, the White Carpathians and the Moravian Beskids, the southeast. The western part of the country is a plateau. The

principal river is the March, a tributary of the Danube. The mildest climate is in the southern part and the most vigorous in the Bohemian-Moravian heights and the frontier mountains. Agriculture occupies 38% of the inhabitants, the produce being mainly sugar beets, wheat, rye, barley, corn and potatoes. The raising of horses, cattle and sheep is also extensive. Large deposits of mineral and brown coal are mined and consequently Moravia has developed industrially. Sugar refining is the most important of the agricultural industries, and brewing second. The textile industry is also well-developed. Moravia's location made it a trade center from early times; its exports embrace both raw materials and manufactured goods. BRNO (Brünn) is the capital. Moravia has a Czech university, a German and a Czech technical university, and is well supplied with other educational institutions. In 1927, the population was 2,821,000, of which 78% were Czechs, 20% Germans; 92% of the inhabitants were Catholic, 3% members of the Czech National Church, 2% Protestants and 1% Jews. Pop. 1930, with SILESIA, 3,563,157. See CZECHOSLOVAKIA, HISTORY OF.

**MORAVIAN BRETHREN.** See MORAVIANS.

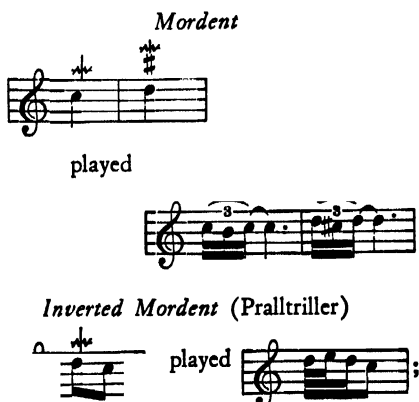
**MORAVIANS**, members of a Christian church, also known as the Unitas Fratrum, or the United Brethren. They originated under the teachings of the martyrs JOHN HUSS and Jerome of Prague, and their first organization was made at Kunwald, Bohemia, in 1457. They were expelled from Bohemia in 1627 and formed in 1722, a colony at Herrnhut, Saxony, which is still their headquarters. In the United States there are three divisions of the Moravians, known as the Moravian Church, the Evangelical Union of Bohemian and Moravian Brethren, and the Independent Bohemian and Moravian Brethren, the two last being small in comparison with the first. The first Moravian missionary came to Pennsylvania in 1734, and in the same year, work was begun in Georgia. In 1741, Bishop Nitschmann and his helpers founded the town of Bethlehem in Pennsylvania, and later, Moravian villages were organized elsewhere. In 1931 they were to be found in 16 states, their largest memberships being in Pennsylvania, Wisconsin, North Carolina, New York, Ohio, Minnesota and North Dakota, in the order mentioned. The doctrine of the Moravian Church is broadly evangelical; the members accept the Apostles' Creed, baptize by sprinkling, and celebrate the Holy Communion at least six times a year. Members are elected by the board of Elders, while the polity is a modified episcopacy, its bishops not being diocesan. The Evangelical Union of Brethren first came to the United States after the revolutionary period of 1848, and their societies are located chiefly in Texas. The Independent Brethren came first in 1858, and are chiefly located in Iowa. Ever since the Unitas Fratrum was organized, it has been noted for its earnest and successful foreign missionary work, especially among the Eskimos and the North American Indians. Services are held chiefly in English, but also in German, Scandinavian and Czech tongues.

**MORAVSKÁ OSTRAVA**, a Czechoslovak city in MORAVIA, the center of the largest hard coal region in the country, as well as of the greatest industrial district, with coke production, smelting plants, sheet metal rolling mills, and various other allied industries. The inhabitants are Czechs, Germans and Poles. Since the incorporation of all the neighboring towns into Greater Ostrava, it is the third largest city of Czechoslovakia. Pop. 1930, 125,347.

**MORAZAN, FRANCISCO** (1792-1842), Central American soldier and statesman, born in Tegucigalpa, Honduras. He led a liberal revolt against Pres. Arce (1829) and became president of the Central American Confederation in 1830. His policy looked toward a rapid modernization of Central America and he tried to improve the quality of the schools, to better means of transportation, to provide for an interoceanic canal, to encourage immigration and revive agriculture. He also had a new penal code prepared, introduced a habeas corpus act, and provided for trial by jury. His policy toward the Church looked to destroying that institution, and with this in view he confiscated its property and established schools and hospitals in the buildings obtained. This policy soon caused revolts and he was forced to flee to South America. In 1842 he was back in Costa Rica, but was defeated, captured and shot.

**MORDANT**, a term applied to substances used in dyeing for fixing colors on textile fabrics. In fabrics which are inactive chemically and have but a slight tendency to absorb dyes, as cotton, it is generally necessary to introduce into their fibers some colloidal substance with greater absorptive powers. Important mordants used for basic dyes include alum, aluminum sulphate, ferrous sulphate, ferrous acetate, ferric nitrate, tin crystals, cotton spirits, stannic oxide, chromium acetate and chrome alum. The principal acid mordants are tannic acid and fatty acids. In etching, corrosive liquids, as aqua fortis, which will eat into a metallic or other surface are termed mordants. See DYEING; ETCHING.

**MORDENT**, a musical ornament or grace-note, three varieties of which are common in music of the classical period. They are as follows:



### Long Mordent



**MORE, HANNAH** (1745-1833), English writer, was born near Bristol, Feb. 2, 1745. Her wit and literary gifts brought her the acquaintance of DAVID GARRICK and other eminent men, and in 1772 she went to London, where she produced several plays. But religion and philanthropy interested her, and in 1795 she began her *Cheap Repository Tracts*. Her style was lively and appealing, and these tracts proved remarkably popular—as did also her novel, *Coelebs in Search of a Wife*. Hannah More did much for the children of the mining districts, and agitated for various reforms. She died near Bristol, Sept. 7, 1833.

**MORE, PAUL ELMER** (1864- ), American literary critic, was born in St. Louis, Dec. 12, 1864. He was educated at Harvard. From 1901-03 he was literary editor of *The Independent*, and from 1903-09 of the *New York Evening Post*. His criticisms have been collected in volume form under the title of *Shelburne Essays*, the various volumes of the series appearing over the period 1904 to 1913. A traditionalist, More showed no sympathy with those writers who wish to destroy established literary doctrines and practices. Among his other works are *Platonism*, 1917, *The Deacon of the Absolute*, 1928, and *The Catholic Faith*, 1931.

**MORE, SIR THOMAS** (1478-1535), English author and statesman, was born in London, Feb. 7, 1478. He was educated at Oxford and studied law at Lincoln's Inn. In his early twenties he desired an ascetic life, wore a hair shirt and scourged himself, but gave up his purpose. As an author he is remembered for *Utopia*, published in Latin in 1516 and in English in 1551, a picture of an ideal commonwealth which has been translated into many languages and has gone through many editions. On the accession of Henry VIII More came into favor at court, was sent on numerous missions to Continental countries, accompanied the king to the Field of the Cloth of Gold in 1520, was knighted, held various offices, and in 1529 succeeded Wolsey as Lord Chancellor. He opposed the divorce of the king from Catharine and refused to take the oath renouncing the Pope's authority. More was thereupon imprisoned in the Tower, found guilty of high treason, and beheaded July 6, 1535.

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**MOREAS, JEAN** (1856-1910), pseudonym of Jean Papadiamantopoulos, French poet, who was born at Athens, Greece, in 1856, and settled at Paris in 1875. His first poetical works, *Les Syrtis*, 1884, and *Les Cantilènes*, 1886, profess to belong to the symbolist school, though their clarity and rhythmic grace approximate rather to the classical. Later he became a fervent disciple of Ronsard, Du Bellay and the poets who, in the 16th century, returned to the cult of the antique. Moreas died Mar. 31, 1910.

**MOREHOUSE COLLEGE**, at Atlanta, Ga., a privately controlled Negro institution, was founded in Augusta, Ga., in 1867, by the Baptist Home Missionary Society. It comprises preparatory, arts and science, special and theological departments and summer and extension courses. In 1929 Morehouse became affiliated with ATLANTA UNIVERSITY. The productive funds in 1931 totaled \$324,000. In 1931-32 there was a student enrollment of 271 and a faculty of 26, headed by Pres. John Hope.

**MOREL**, an edible mushroom (*Morchella esculenta*), highly prized for food, found widely in grassy woodlands in Europe and North America. The plant grows from 2 to 6 in. high with a thick hollow stem surmounted by an oval or somewhat elongated, irregularly wrinkled cap. The morel grows usually in damp situations, appearing most abundantly during rainy weather in May and June. Besides the foregoing several other species occur in the eastern United States and Canada. All are edible, and are readily distinguished by their peculiar form from the poisonous fungi. In flavor morels are regarded as superior to most MUSHROOMS.

**MORELIA**, a city of Mexico, capital of the state of Michoacan, situated in the Valley of Guayangareo about 227 mi. northwest of Mexico City. The main part of the city is some distance from the station and is connected to it by tramcars. Public buildings, telephones and electric lights contribute to the modern aspect of the city, while the cathedral, begun in 1640 and finished in 1744, El Palacio de Gobierno which houses the state library, and the remains of an aqueduct dating from 1785-89, are relics of the older civilization. Morelia is one of the picturesque old towns of the republic; it was founded in 1541, captured by Hidalgo in 1810, and is the birthplace of Morelos and Iturbide. Pop. 1921, 31,148; 1930, 63,277.

**MORELOS**, a small inland state of Mexico, situated on the southern part of the great central plateau, with an area of 1,895 sq. mi. Its surface is broken by many mountain ranges which traverse it from north to south, with deep valleys lying between. The rivers are swift and narrow, and are noted for their picturesque falls. The chief one of these is the Amacusac. The state is dotted with a number of small lakes, one of which is Lake Tequesquitengo, which was the site of a town until about half a century ago, when it began to sink and was finally submerged. In the northeast the Popocatepetl range can be seen. Ruins of temples, Indian towns and other relics are found in the state. The products are tropical fruits, cane and many kinds of wood. The capital is Guernavaca, and other towns are Cuautla, Tacubaya and Yautepec. Pop. 1921, 103,440; 1930, 132,582.

**MORELOS Y PAVON, JOSÉ MARIA** (1765-1815), Mexican patriot and priest, born in Valladolid. He began to study for the Church at the age of 32 and had charge of the parishes Caracuaro and Mirupetaro. When, after taking Guanajuato, Miguel Hidalgo came to Valladolid, Morelos y Pavon offered him his services in the revolutionary cause. He was

made colonel and charged with spreading the revolution in southern Mexico. This mission he accomplished with great skill and valor, defeating several Spanish armies, and advancing on Mexico City, where Porlier surrendered, Jan. 22, 1812. He held Cuatla for 62 days against the Spanish under Calleja, finally evacuating the city and capturing Oajaca, Oct. 1812, and Acalpulco Nov. 25, 1812. He inaugurated the first National Congress at Chilpaucingo, Sept. 13, 1813, declaring the nation an independent republic. In an attempt to capture Valladolid, he was defeated and captured by Augustin Iturbide. Taken to Mexico City, he was condemned to death and shot as a traitor.

**MORENO, MARIANO** (1778-1811), Argentinian lawyer and patriot. He took a leading part in the revolution against Spain in 1810, founding the *Gaceta de Buenos Aires* for the purpose of propagating liberal ideas. When the provisional junta was formed in 1810, Moreno was made secretary of military and political affairs, and distinguished himself to such a degree that he has been called "the soul of the revolution of 1810." He died at sea while en route to England on a diplomatic mission for Argentina.

**MORETON BAY CHESTNUT** (*Castanospermum australe*), a medium-sized tree of the pea family native to southeastern Australia, bearing large edible seeds somewhat resembling chestnuts. It grows 40 or 50 ft. high with large divided leaves and bright-yellow pealike flowers in long clusters. The fruit is a bright-brown pendulous pod containing three to five roundish, somewhat flattened seeds.

**MORETO Y CAVANA, AGUSTIN** (1618-69), Spanish dramatist, was born at Madrid in 1618. Moreto studied at Alcala, later attaching himself to the household of the cardinal-archbishop at Toledo, where he took holy orders. Subsequently he retired from the world into an ascetic order, dying at Toledo, Oct. 28, 1669. He excels all his contemporaries in stagecraft, gaiety and humor, *The Handsome Don Diego* being superlative high comedy. His religious pieces were less successful.

**MORGAN, ARTHUR ERNEST** (1878- ), American educator and engineer, was born in Cincinnati, O., June 20, 1878. He had a high school education and subsequently acquired an engineering knowledge through self-study. In 1902, at St. Cloud, Minn., Morgan began to work with problems of flood control. Five years later he became supervising engineer for the United States Government drainage investigations and in 1909 he organized the Morgan Engineering Co., which conducted several important reclamation projects in the South. Morgan was appointed president of Antioch College in 1921, and the school was reorganized according to his plan. He is the author of *The Miami Valley and the 1913 Flood*, 1918; *My World*, 1927, and many technical studies in engineering.

**MORGAN, JOHN HARCOURT ALEXANDER** (1867- ), American educator, was born at Strathroy, Ont., Can., Aug. 31, 1867. He graduated from the University of Toronto in 1889, and studied

at Cornell and at the Marine Biological Laboratory, Woods Hole, Mass. He was entomologist, horticulturist and zoologist at Louisiana State University, 1889-1905; then went to the University of Tennessee. He became dean of the college of agriculture there in 1913, and president in 1919.

**MORGAN, JOHN PIERPONT** (1837-1913), American capitalist and banker, was born at Hartford, Conn., Apr. 17, 1837. Following an education at the University of Göttingen, he began his career with Duncan, Sherman & Co., Bankers, New York City. In 1860 he became agent for George Peabody & Co., Bankers, London, and then head of J. S. Morgan & Co., its successor. Four years later he organized Dabney, Morgan & Co., which was later merged into Drexel, Morgan & Co., and in 1895 became J. P. Morgan & Co. Under the leadership of Morgan, this firm, closely connected with the leading banking houses of London and Paris, grew into one of the strongest financial institutions of the world. Morgan rescued from the hands of receivers and reorganized many railroads, his financial abilities being particularly notable in connection with the re-financing of the New York Central Railroad, the New York, New Haven & Hartford Railroad, the Erie Railroad and the Big Four System. In 1901 he organized the United States Steel Corporation, which was one of his most successful ventures. His one failure was in connection with the Northern Pacific Railroad Co., though his methods of manipulating properties led occasionally to embarrassment. About this time he gained control of large shipping properties and effected a combine of shipping on the Atlantic Ocean. He brought about the cooperation of railroad and coal properties in the state of Pennsylvania, bringing them under the sphere of his influence. He also furnished aid in floating a bond issue to restore the United States Treasury reserve to its legal basis in 1895. He died in Rome, Italy, Mar. 31, 1913.

For the latter part of his life, Morgan's wealth dominated the money markets of the world. It was left, with the exception of a comparatively small sum specifically bequeathed to charity, to his son, JOHN PIERPONT MORGAN, JR. Following the elder Morgan's desires, the magnificent collection of art was given to the Metropolitan Museum, New York, and is there housed in a separate wing. The Morgan Library, containing thousands of rare manuscripts and books, was dedicated as a museum for scholarly research in 1923.

**MORGAN, JOHN PIERPONT, JR.** (1867- ), American financier, son of John Pierpont Morgan (1837-1913), was born at Irvington, N.Y., Sept. 7, 1867. He entered his father's bank, succeeding his father, on his death in 1913, as head of J. P. Morgan & Co., and its affiliated organizations. His first major activity was the negotiation for the purchase of the rights of the French Panama Canal Company, in which he represented the U.S. government. The transactions of the Morgan bank were enormously increased under the impetus of the Allied financial

requirements during 1914-18. At the outbreak of hostilities, Morgan arranged for the advance of \$12,000,000 to Russia, and by 1917 had arranged loans of \$1,550,000,000 to the British and French governments. Following the war, the bank underwrote under the Dawes Plan loans amounting to \$1,700,000,000 for the Allied nations and Germany for reconstruction. Morgan also served on the commissions formed to study the problem of German reparations.

**MORGAN, JOHN TYLER** (1824-1907), American statesman, was born in Athens, Tenn., on June 20, 1824. He began practising law in Alabama in 1845, and was prominent as a campaign speaker for the Democratic party. In 1861 he joined the Confederate army and, when a lieutenant colonel, served under Gen. Albert Sidney Johnston. After the war he resumed law practice in Selma, Ala., and in 1877 was sent to the United States Senate, where he remained until his death. He was a member of the board to arbitrate the Bering Sea fisheries dispute in 1892, and in 1898 was on the committee which prepared laws for the Hawaiian Islands. He died in Washington on Jan. 11, 1907.

**MORGAN, THOMAS HUNT** (1866- ), American biologist, was born in Lexington, Ky., Sept. 25, 1866. In 1890 he received the Ph.D. from Johns Hopkins University. From 1891 to 1894 he was associate professor of biology in Bryn Mawr College, and for the following ten years was a full professor there. In 1904 he was called to the chair of experimental zoölogy in Columbia University. Here for nearly 25 years he carried on his researches in heredity. Out of them has grown the gene theory for which he is best known. In 1928 he became director of the William Kerckhoff Laboratories of the Biological Sciences in the California Institute of Technology. He is the author of *Evolution and Adaptation*, *Experimental Zoölogy*, *Heredity and Sex*, *The Mechanism of Mendelian Heredity*, *The Physical Basis of Heredity*, *The Theory of the Gene*, *A Critique of the Theory of Evolution* and *Experimental Embryology*.

**MORGAN CITY**, a port city in St. Mary's Parish, southern Louisiana, situated on Tiger Island, bounded by Lake Palourde, Bayou Boeuf and the Atchafalaya River. Buses, steamships and the Southern Pacific Railroad afford transportation. The city is a muskrat fur market and an important shipping point for sea-food, especially oysters, and for crushed shell and lumber. It is in a fertile sugar- and corn-growing region. Fish, deer and ducks abound in the vicinity. The island was originally settled by sugar planters in 1860 and a town was incorporated under the name of Brashear. It was later renamed Morgan City after the owner of the Morgan Steamship Line. Pop. 1920, 5,429; 1930, 5,985.

**MORGAN COLLEGE**, at Baltimore, Md., a co-educational arts and science college for Negroes, was founded in 1867 as the Centenary Bible Institute for the education of young men for the ministry. The present title was adopted in 1890 in recognition of Dr. Lyttleton F. Morgan, the college's benefactor. In

addition to the college course, there are departments for sub-freshmen. The grounds and buildings are valued at \$516,746. In 1930 there were 462 students and a faculty of 18, headed by Pres. John O. Spencer.

**MORGANITE**, a pink or rose-red variety of the semiprecious **BERYL**, known also as *vorobievite*. Beryl is a beryllium aluminum silicate; in the pink and colorless varieties the beryllium is often partly replaced by lithium, sodium, potassium and caesium. It crystallizes in the **HEXAGONAL SYSTEM**. Morganite commonly occurs in granite pegmatites, and is found in California and Madagascar. *See also* **GEM STONES**.

**MORGAN'S RAID**, June-July 1863, a Confederate enterprise of the **CIVIL WAR**. Col. John H. Morgan, commanding 2,500 cavalymen, was ordered to make a demonstration in Kentucky, in the hope of drawing all or part of the Union army under Gen. Rosecrans out of Tennessee. Morgan exceeded his instructions, crossing the Ohio at Brandenburg, and entered upon a swashbuckling invasion of Indiana and Ohio. The raiding party eluded groups of local militia, and successfully skirted the Union army at Cincinnati under Generals Hobson and Shackelford. The pursuing army closed in. A sudden rise in the Ohio allowed Federal gunboats to ascend to Buffington Island, and, prevented from recrossing the river, 700 of Morgan's men were captured. Most of the remainder reached Kentucky safely; some continued with Morgan into Pennsylvania, in the expectation of joining Gen. Lee. Morgan was captured near New Lisbon, O., and confined at Columbus. On Nov. 27 he escaped, and safely reached the Confederate lines.

**MORGANTON**, a town in western North Carolina, the county seat of Burke Co. It is situated in the Blue Ridge Mountains, 60 mi. east of Asheville, and is served by the Southern Railroad. The principal industries are lumber mills, furniture factories, cotton mills, tanneries, flour mills and machine shops. Gold and silver are mined in the vicinity. The North Carolina School for the Deaf and Dumb, and the State Hospital for the Insane are located here. Morganton also has a sanatorium and is popular as a health resort. Pop. 1920, 2,867; 1930, 6,001.

**MORGANTOWN**, a city of north central West Virginia, and county seat of Monongalia Co., on the Monongahela River, 75 mi. south of Pittsburgh, Penn. The Baltimore and Ohio and the Monongahela railroads serve the city. The development of rich coal mines, glass-sand pits, and limestone quarries in the surrounding territory has contributed to Morgantown's industrial progress in the manufacture of glass, tin-plate, brick, and tile. In 1929 the factory output reached approximately \$3,000,000; the retail trade amounted to \$8,755,272. The city is the home of **WEST VIRGINIA UNIVERSITY** (1867). A large stadium has been completed. The scenic features around Morgantown include Cheat River canyon, Decker's Creek gorge, and Lake Lynn. Zackquill Morgan founded Morgantown about 1770; it was chartered in 1905. Pop. 1920, 12,127; 1930, 16,186.

**MORGARTEN, BATTLE OF**. *See* **SWITZERLAND, HISTORY OF**.

**MORGENSTERN, JULIAN** (1881- ), American rabbi and educator, was born at St. Francisville, Ill., Mar. 18, 1881. He studied at the University of Cincinnati, received his rabbinical training at the Hebrew Union College, 1902, and continued his studies at the universities of Berlin and Heidelberg. He was rabbi at Lafayette, Ind., 1904-07, and was appointed professor of Biblical and Semitic languages, at Hebrew Union College, 1907, becoming president in 1922. He is author of *The Doctrine of Sin in the Babylonian Religion*, *A Jewish Interpretation of the Book of Genesis*, and a large number of important contributions to learned periodicals and other publications.

**MORGENTHAU, HENRY** (1856- ), American diplomat, was born in Mannheim, Germany, Apr. 26, 1856. He was brought to America in 1865 and was educated at the College of the City of New York and at Columbia Law School. From 1879 to 1899 he practiced law in New York, where he acquired extensive interests in financial and industrial enterprises. As a prominent Democrat, he was Ambassador to Turkey, 1913-16, and subsequently served on the commission to investigate conditions in Poland. From 1919 to 1921 he was vice-chairman of the Near East Relief. His writings include *Ambassador Morgenthau's Story* and *All In a Lifetime*.

**MORISON, SAMUEL ELIOT** (1887- ), American historian, was born in Boston, Mass., July 9, 1887. He graduated from Harvard in 1908, and studied at Oxford and at the École des Sciences Politiques, Paris. He taught history at the University of California in 1914, and since 1915 has been instructor, lecturer and professor of history at Harvard. He was the Harmsworth Professor of American history at Oxford, 1922-25. His publications include *Life of Harrison Gray Otis*, *Maritime History of Massachusetts*, *Sources and Documents on American Revolution*, *History of the United States*, *Tercentennial History of Harvard University* and *Builders of the Bay Colony*.

**MORITURI TE SALUTAMUS**, a Latin phrase meaning "We (who are) about to die salute thee." They were the words with which Roman gladiators in the arena saluted the emperor. The heroic phrase has frequently appeared in literature, used seriously and with mock-seriousness.

**MORITZ, KARL PHILIPP** (1757-93), German writer, was born at Hameln, Sept. 15, 1757. He was Professor of Archaeology and Aesthetics at the Berlin Academy and wrote extensively on these subjects. In his two books, *Reisen eines Deutschen in England*, 1788, and *Reisen eines Deutschen in Italien*, 1792-93, he describes his travels abroad. His novels, *Anton Reiser*, 1785, and *Andreas Harknoppf*, 1786, were reputed to depict faithfully the contemporary educated classes of Germany. Moritz died June 26, 1793.

**MORLEY, HENRY** (1822-94), English author, was born in London, Sept. 15, 1822. He was edu-



cated at King's College, London, and established schools on Moravian methods in Manchester and Liverpool. He edited *The Examiner*, 1861-67, and in 1865 became Professor of English Literature at University College, London. His works include the *English Writers* series of biographies, *A Defense of Ignorance*, and *A First Sketch of English Literature*. He died at Carisbrooke, Isle of Wight, May 14, 1894.

**MORLEY, JOHN** (1838-1923), English author and statesman, later Viscount Morley of Blackburn, was born at Blackburn, Dec. 24, 1838. He was educated at Lincoln College, Oxford, and in 1859 started upon a literary career in London where he edited and wrote for newspapers and magazines, served as editor of the *English Men of Letters* series, and gained a reputation as a keen and vigorous radical thinker. In 1883 Morley entered Parliament as a Liberal, and in the Gladstone cabinets of 1886 and 1892 was Secretary for Ireland. An ardent supporter of Irish Home Rule, he was prominently identified with that policy throughout his public life and was largely responsible for Gladstone's attitude regarding it. As Secretary of State for India, 1905-10, Morley remodeled India's system of government. In 1908 he was made Viscount Morley of Blackburn and 6 years later retired from public life, resigning from the Cabinet at the outbreak of the World War. In his 30 years' eminent service he exerted an important and lasting influence on British affairs. Because of his honesty and sincerity he was called "Honest John." Among Morley's contributions to literature were several volumes of essays and numerous biographies, the former including *Critical Miscellanies* and *Studies in Literature*, and the latter lives of Burke, Cromwell, Walpole, Cobden, Diderot, Voltaire and Rousseau. His *Life of Gladstone*, 1903, is one of the great biographies of English literature and his *Recollections*, 1917, is an important and enriching contribution to knowledge of English life and politics during Morley's period. The statesman died at Wimbledon, Sept. 23, 1923.

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**MORMON CRICKET.** This insect is not a true cricket, but a long-horned grasshopper (family *Tettigoniidae*). It is wingless and looks somewhat like a cricket. In geographical range it is restricted to Utah and adjoining states. It feeds on many wild and cultivated plants and is more or less migratory. Eggs laid in summer hatch the following spring. Arsenicals used as dusts or sprays are recommended for control.

**MORMONS**, officially known as the Church of Jesus Christ of the Latter Day Saints, a society founded by Joseph Smith (1805-44), at Fayette, Seneca County, N.Y., as the result of "visions." One of these enabled him to obtain "the sacred records, an abridgment of the history kept by the ancient inhabitants of America, . . . engraved on plates which had the appearance of gold." These records, constituting the *Book of Mormon*, he translated and dictated to Oliver Cowdery and others, who wrote

them down. As the result of the missionary work of these two men and others, churches were established in Ohio, Missouri, Illinois and elsewhere, in spite of much local opposition. In 1839 mob violence drove them from Missouri, and in 1844 Smith was killed by a mob at Carthage, Ill. Two years later, Brigham Young, the new president of the Church, led a general migration to Utah, from which center Mormonism spread over the adjacent states. Outside of Utah, the sect is strongest in Idaho, Arizona, Wyoming, Nevada, Colorado, Oregon and California.

A characteristic feature of the Church is the manner in which it enters into and influences every department of the life of its members, caring for them in sickness and poverty, providing their education and amusements, and quite frequently supplying an economic foundation for their daily living. The Bible and the *Book of Mormon* are both regarded as the Word of God. Mormons believe that the New Zion will be built in America, and that Christ will return to reign over it in person. The doctrine of plural marriages announced in 1852 is now prohibited by the Church. The Church's principal source of income is its tithing system, by which each convert is expected to voluntarily give one-tenth of his property, and thereafter, one-tenth of his income. *See also* LATTER DAY SAINTS, REORGANIZED CHURCH OF THE.

**MORMYR**, the name for a family (*Mormyridae*) of curious, soft-finned, fresh-water food fishes inhabiting the rivers of tropical and sub-tropical Africa. They vary greatly in the form of the body and in the shape of the head, often having a prolonged, curved snout. The mouth is usually small and the tail is provided on either side with a feeble electric organ. Mormyrs were venerated by the ancient Egyptians and often depicted on their monuments.

**MORNING-GLORY** (*Ipomœa purpurea*), a tall, twining, hairy-stemmed annual of the morning-glory family (*Convolvulaceæ*) universally grown as a porch and trellis plant. It is a native of tropical America which has become more or less naturalized in mild climates through cultivation. The trailing or twining stem, branching from the base, grows usually 4 to 10 ft. high. It bears large, long-stalked, heart-shaped leaves and funnel-form blue, pink or variegated flowers, 2 to 3 in. long, opening in early morning and lasting in bright sunlight only a few hours. Many races and hybrids with related species are grown. They are of easy cultivation, thriving best in rich moist soil and in a sunny site.

**MORNINGSIDE COLLEGE**, a privately controlled coeducational institution at Sioux City, Ia. It was established as the University of the Northwest in 1889 by representatives of the Northwest Iowa Annual Conference of the Methodist Episcopal Church. The Institution was chartered as Morningside College in 1894, and 20 years later, Charles City College united with it. The grounds and buildings are valued at \$632,713, and the library contains 30,000 volumes. In 1930 there were 618 students and a faculty of 47, headed by Pres. Frank E. Mossman.

**MOROCCO**, an old empire or sultanate now confined to that part of northwest Africa bounded on the east by Algeria, on the south by the Sahara, on the west by the Atlantic and on the north by the Mediterranean. The country is divided into three zones: the French protectorate of Morocco, the "Riff," controlled by Spain, and the international zone of TANGIER.

The area of French Morocco is estimated at about 200,000 sq. mi. and the population at about 4,229,146 in 1926; 4,016,882 native Moslems, 107,552 native Jews and 104,712 foreigners, the rest being mainly Berbers, Arabs and some Negroes. The protectorate extends from the Atlantic, over the Atlas Mountains to the Shotts plateau and into the Sahara in the south.

The Spanish area is about 18,300 sq. mi. Spain also controls the enclave of Ifni, about 1,000 sq. mi., in the south of Morocco. The Riff Mountains run parallel to the north coast, and the native tribes have only recently been subdued with French aid. Pastoral occupations prevail. Copper is known to exist, and iron, zinc and lead are mined. The population of Spanish Morocco was estimated in 1926 at somewhat under 1,000,000.

The Tangier district covers about 225 sq. mi. Economic development in the zone is unimportant, although Tangier has a considerable trade. By a convention of 1923 the district was to pass under the control of an International Commission as from June 1925, but the actual operation was later, 1928, the subject of an agreement between France, Spain, Italy and Great Britain. The population in 1926 was estimated at 60,000.

The coastal plain is fertile; barley, wheat, maize, olives, vines, figs, oranges and almonds are widely cultivated. Numerous cattle are raised. An important crop belt is at the foot of the mountains. Cotton, which was widely grown in the 18th century, has again received attention in recent years. Agriculture is mainly in native hands, and the colonists are largely engaged in fruit-growing. Forests are being carefully conserved, but cork-oak and cedar have only local importance at present. In the Sahara are numerous oases with date palms. Considerable mineral wealth has been found. The output of phosphates, high in phosphate content and existing in enormous quantities, is controlled by the state. Over a million tons were produced in 1927. The protectorate stimulates mining enterprise by state participation.

The chief towns are CASABLANCA, an important port; Ber Reched, a railroad junction; RABAT, the center of French administration and the chief seat of the sultan; FEZ, surrounded by mud walls; and Safi, possessing a good natural harbor.

Morocco is a monarchy in which the sultan exercises supreme civil and religious authority; he is obliged, however, to follow the advice of the French resident-general in all matters. The Spanish zone is garrisoned by Spanish troops and is administered by a *kalif*, appointed by the sultan from candidates nomi-

nated by the Spanish government. France represents the ruler in all foreign relationships.

**MOROCCO, HISTORY OF.** Occupying the northwesternmost corner of Africa, Morocco is one of three countries that border both the Mediterranean and the Atlantic. To the east lies French Algeria, from which it is separated by no natural boundary, and to the south the Great Desert and the Spanish possession of Rio De Oro. Lying entirely within the north temperate zone, the climate, one typical of the Mediterranean basin, is notably healthful. With an area of about 200,000 sq. mi., Morocco has a population of above five millions, the most numerous element being the aboriginal Berbers, found in general in the mountainous districts. The plains are largely inhabited by the Arabs and Moors, the latter being a mixture of the former two races. The Moors predominate in the cities, where also is found a considerable Jewish element devoted almost exclusively to commerce. A fifth racial group is the negro, these having been introduced as slaves from the interior. The European population, negligible until the establishment of the French protectorate, has in recent years shown a rapid increase.

Islam is the religion of the country, and the predominant language and culture are Arabic. About one-half of the indigenous population, however, speak Berber dialects. The principal industries are agriculture and stockraising. France, to-day, enjoys the major portion of both the imports and exports.

Records of Moroccan history in the ancient period are very scant. In Greek and Roman mythology Morocco is associated with Hercules, Atlas, and the Garden of Hesperides. There is evidence that the Carthaginians planted colonies on the Moroccan coast, but these probably were never more than mere trading posts. The authenticated history of Morocco begins with the period of Roman occupation, but even then, being the westernmost province of the Empire, Mauretania Tingitana did not receive notice from Roman writers. Roman authority was first established here during the reigns of Augustus and Tiberius in the first century of the Christian era, and lasted for almost four centuries. It is doubtful if the Berber tribes were ever profoundly influenced by Roman civilization or if Rome ever realized great benefits from this province. Certainly Roman Morocco did not extend farther south than Salli (Roman *Sala*) or farther inland than Volubilis, near Mekinez, where extensive and impressive ruins are still to be seen. Too weak to defend itself against the Barbarians, Mauretania fell before the Vandal invasion of 429, but was restored temporarily to the Byzantine Empire through the campaign of Belisarius in 534.

**Arab Conquest.** In the 7th century the Arabs under Okba conquered North Africa and Islam supplanted Christianity here, while Arabic civilization replaced the Roman. Early in the 8th century the Arab conquest was extended into southern Morocco by Musa ibn Nosair, and in the same period Tarik ibn Zaid at the head of a Berber force conquered

Visigothic Spain. The Moroccan Berbers were not long content to remain under their Arab conquerors, revolting in 739. But apparently Islam had taken rapid root among them, for when, in 788, Idris I, descendant of the Prophet, appeared a refugee among them, he was welcomed and was able to lay the foundations of the first Moorish Empire. His tomb at Zarhoun is to-day one of the most sacred shrines of the western Muslim world. Idris II, his son, ably continued his work, and built the city of Fez. The Idrisid dynasty after two centuries of reigning was followed by the Miknasa and Maghrawa for brief periods. In 1061 the more important Murabti (Almoravids) came to power. Their outstanding representative, Yusef I, also ruled southern Spain. During this period the southern capital of the Empire, Marrakesh, was founded. Under the Muwahhadi (ALMOHADES), who supplanted the Murabti in 1149, the Moroccan Empire reached its zenith toward the close of the 12th century, including most of Spain and all of North Africa to the frontiers of Egypt. Yakub el Mansur, 1184-99, was one of the best rulers the country has ever known. About the middle of the 13th century the Beni Marin, a Berber tribe, overthrew the Muwahhadi, establishing themselves upon the Moroccan throne, which they continued to occupy down until 1524. Yakub II, an early member of this family, distinguished himself for his piety, philanthropy, love of learning and his friendship toward Europeans. On various occasions he intervened in affairs in the Iberic peninsula and for a time was master of almost the whole of Spain. After 1359 the Marinids were divided between rival claimants to the throne and the civil wars that resulted constituted a standing invitation to the Portuguese and Spanish to make conquests upon the Moroccan coasts. The Wattasi, who reigned very briefly in the first half of the 16th century, proved themselves no abler than the Marinids in preserving order or in protecting the Muslim world against Christian onslaughts. It seemed as if Morocco was destined to suffer the fate of Muslim Spain.

At this juncture the Sa'adi dynasty, 1550-68, claiming descent from Mohammed, came to power on a wave of popular religious fanaticism against the Christians. A holy war was launched against the Portuguese, and by the close of the 16th century most of the ports on the Atlantic coast of Morocco had been recovered. In 1578 occurred the famous battle of El Ksar, in which King Sebastian of Portugal lost his life, thereby preparing the way for the annexation of Portugal by Spain. Ahmed IV, "the victorious" or "the golden," conquered Timbuktu in 1591 and established his sway over western Sudan. He was an able administrator and a great builder.

A fresh wave of religious fanaticism at the middle of the 17th century brought the Filali to the Moroccan throne, who continue to reign to the present day. Like several of the preceding dynasties they claim descent from the Prophet. Under them the Moroccan Empire was once more consolidated and order re-

established. This was particularly the work of Mulai Ismail, "the bloodthirsty" (1672-1727), who has left a tradition of able administration, as well as of picturesque personality and extreme cruelty. During this period piracy against European commerce reached its height, and thousands of European captives were enslaved in Morocco. Mulai Ismail reconquered Larache from the Spanish, and the English, who had acquired Tangier twenty years earlier, abandoned it in 1683. Three decades of disorder followed the death of this strong ruler, which were ended only with the advent of Mohammed XVI (1757-90), during whose reign real commercial and diplomatic relations were permanently established with the European Powers. The second decade of the 19th century saw piracy and the enslavement of Christian captives officially abolished.

**European Penetration.** As the century advanced Morocco sank ever more deeply into stagnation and decay, the sultan becoming but nominal ruler over large areas of his Empire. Even as vigorous, intelligent and warlike a ruler as Mulai Hassan, 1873-94, was unable permanently to strengthen his position. Meanwhile foreign interests in Morocco were growing, especially after the negotiation of the British commercial treaty of 1856, and with the development of European interest in the dark continent during the last quarter of the 19th century. By successfully taking advantage of European rivalries the sultans managed to preserve the integrity and independence of their Empire for many years.

The three powers primarily interested in Morocco commercially and politically in the 19th century were Spain, Great Britain, and France. The Spaniards, who held five posts, Ceuta and Melilla being the most important, on the Atlantic littoral of Morocco believed themselves destined one day to rule the whole country. Generally their policy was to block improvements which promised to strengthen Morocco or to increase the influence of their more vigorous rivals. At some favorable time in the future Spain would fulfill her "manifest destiny" as regarded the Moors. The presence of the Spaniards in the posts of northern Morocco afforded constant grounds for conflicts, and occasionally, as in 1859-60 and in 1893, Spain sent expeditions against the Moroccans. Diplomatic pressure rendered such campaigns barren of political results. Great Britain, enjoying about two-thirds of the commerce of the country, a neighbor at Gibraltar, and vitally interested in maintaining the free passage of the Strait of Gibraltar, harbored no aggressive designs upon Morocco and succeeded in winning the complete confidence of successive sultans, especially during the period 1845-86 when Sir John Drummond Hay represented Great Britain at Tangier. Hay spoke of himself as the "Sentinel of the Strait," and was particularly successful in thwarting the ambitious schemes of his rivals. He also exerted his influence moderately in behalf of commercial and other reforms, but regarded England's political interest in the maintenance of the independence and integrity

of Morocco as the paramount consideration. France, through her annexation of Algeria in 1830, became a neighbor of Morocco, and it soon became apparent that the tranquillity of Algeria was very much dependent upon the conditions existing in Morocco. The situation was complicated by the lack of a definite boundary and the inability of the Sultan to control his unruly subjects. France suffered many provocations and was forced from time to time to send punitive expeditions across the frontier, and once, in 1844, to wage war upon the sultan. An attempt to strengthen the authority of the sultan, sponsored by Great Britain supported by Spain, was made at the Madrid Conference in 1880, in which the question of abolishing abuses that had developed from the treaty right of extending foreign protection to natives employed by Europeans was considered. These efforts were unavailing, because of the determined opposition of France and Italy who received the quiet support of Germany.

The closing years of the 19th century were marked by the great increase of German commercial interests in Morocco, which threatened to assume a political character. The growth of Spanish interests did not keep pace with those of the other powers. Simultaneously the internal situation in Morocco grew desperate. Influenced by European favorites, Abdul Aziz IV, 1894-1908, squandered his money, oppressed his subjects with taxation, and antagonized them by adopting European innovations. Disorders became general and were a constant source of danger to Europeans and their interests. The French Minister for Foreign Affairs, M. Delcassé, 1898-1905, harbored a strong desire to round out the French colonial empire in Northwest Africa by acquiring control over the wealthy land of Morocco. Having previously won the assent of Italy to his project, in 1904 he reached an agreement with the British Government whereby in return for a free hand in Egypt, the latter consented to allow France to act in Morocco. Later the same year France and Spain agreed upon their respective spheres of influence there. Refusing to recognize the existence of German political interests, Delcassé now proceeded to act without consulting her. He pressed Morocco to accept a series of reforms designed to prepare the way for the establishment of a French protectorate. Prompted by Germany, the Sultan rejected these, and proposed a general conference of interested powers to consider the Moroccan question. Germany accepted, and clearly made known her intention to support Morocco. In the crisis that followed, the French parliament, unwilling to go to war, accepted the resignation of M. Delcassé, who refused to compromise with the Germans. President Roosevelt used his influence advantageously to prevent a clash, and an international conference on Moroccan affairs was held at Algeciras in the early months of 1906. While the independence and integrity of Morocco were maintained in principle, the actual arrangements made were generally favorable to France, particularly in the important

matters of finance and the policing of the Moroccan ports. See ALGECIRAS CONFERENCE.

**French Occupation.** Subsequent disorders in Morocco brought French intervention. By an agreement in 1909 between France and Germany, the latter recognized the special political interests of France in Morocco. When France in 1910 sent troops to Fez on account of disorders in that region, Germany, convinced that France either could not withdraw or had no intention of doing so, sent a warship to Agadir "in order to protect German interests." A second time it seemed the Moroccan situation would bring about a European war. Great Britain stood firmly by France in the crisis, which was terminated by an agreement in 1911, whereby Germany virtually consented to the establishment of a French protectorate over Morocco, and in return France agreed to make a substantial cession of territory to Germany in French Congo.

France lost no time in negotiating a treaty with Morocco, Mar. 30, 1912, whereby she established a protectorate over that country. In November of the same year a definitive agreement was reached with Spain concerning the Spanish protectorate over northern Morocco. In order to protect British interests at the Strait of Gibraltar about 100 sq. mi. of territory, including the city of Tangier, was set apart as a special international zone.

General Lyautey was appointed first French resident-general of Morocco. During his able administration Morocco was pacified by 1926, the most serious problems arising from German intrigues among the natives during the World War and the revolt of the Riffian chieftain Abd el Krim, 1919-26. The basis of French administration was firmly laid during this period, with special care to avoid interference with native institutions and customs as much as possible. In this connection the experience gained by France in Algeria and Tunisia proved very helpful. Since 1912 Morocco has made remarkable material progress, and there has been a large influx of Europeans into the country. E. F. C.

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**MORONS.** See FEEBLE-MINDEDNESS.

**MORPHEUS**, in classical mythology, son of Sleep and Night, was god of dreams. He is represented as an old man with wings, who pours the vapor of sleep from a horn.

**MORPHINE**, one of the alkaloids obtained from OPIUM, in which it is present to the extent of about 10 per cent. It is prescribed in the form of the sulphate, which is a white crystalline substance.

Morphine is a depressant of the central nervous system. It has a descending action; that is, it begins with the higher faculties, then affects the centers of emotion and sensation, and later those controlling vital processes. The rates of respiration and heart-

beat are reduced, peristalsis is diminished, and the pupils contracted. In small doses it relieves pain, in medium-sized doses it produces deep sleep from which it is difficult to arouse the patient. In large doses respiration and heart action are gravely embarrassed and death may result. COFFEE, or its alkaloid CAFFEINE, has an effect opposite to morphine, and hence it is used as a physiological ANTIDOTE for morphine poisoning.

Morphine should not be used unless prescribed by a physician to relieve pain, or to relieve the sleeplessness brought on by pain, as it rapidly induces an habituation which it is extremely difficult to break.

**MORPHOLOGY**, the study of the form or structure of animals or plants. It stands in contrast to the physiology or study of function of the same objects. It embraces embryology, comparative anatomy and all phases of zoology or botany where emphasis is laid upon form. Recently considerable work has been done in the field of experimental morphology. Here the factors shaping animal or plant form are manipulated by the investigator with a view to determining the nature of these factors and their various effects. The fertilized egg is a single cell which develops by a series of orderly processes into the complex, many-celled organism. Parts which early differentiate have a profound effect on the differentiation of adjacent tissues. The effect of one formed part on another is being studied by an increasing number of students. Their work as well as that of the cytologists who study the structures within the individual cells may be considered branches of morphology.

Structures which have similar functions may arise from different parts. The wings of birds and insects although serving the same purpose arise from different structures and are described as analogous. Structures which have a common origin are described as homologous. There are various kinds of homology. Where a part such as the thumb skeleton can be traced through the vertebrate series this series of bones wherever they occur are said to exhibit homogeny. Where structures have been molded in different ways out of the same tissue they are described as showing homoplasy. The beak of a turtle and the beak of a bird both are formed from horn produced by epidermis. Since the epidermis has a common origin in all animals the horny growths may be considered to have a common origin even though there is no part for part inheritance. Evidence for homology is secured from palaeontology, comparative anatomy and embryology (see these articles). G. K. N.

**MORRILL, JUSTIN SMITH** (1810-1898), American Senator, was born in Strafford, Vt., Apr. 14, 1810. He was employed successively as a clerk, merchant and farmer until 1855 when he entered the House of Representatives as an anti-slavery Whig. He, however, soon changed his politics and joined the Republican party and in 1867 became a member of the United States Senate where he remained 31 years. While in the House he introduced the bill providing public land grants to establish state colleges

for teaching agriculture and the mechanical arts. This bill became a law in 1862. In 1890 he presented the second Morrill Act obligating the Federal Government to give \$25,000 annually to each land grant college. He died in Washington, Dec. 28, 1898.

**MORRILL TARIFF ACT**, passed Mar. 2, 1861, a moderately protectionist measure, with minor modifications in effect throughout the Civil War. The result of the Tariff of 1857, enlarging the free list and lowering many duties, was a deficit of \$50,000,000 in the national income, 1858-60. In 1859-60, a plurality of the House of Representatives being Republican, Justin S. Morrill introduced a bill in which his own protectionist views were modified by practical considerations. Many commodities which were subject to undervaluation and fraudulent entry were changed from an ad valorem to a specific duty basis; other ad valorem rates were returned to the standards of the Tariff of 1846. The bill passed the House May 10, 1860 and, together with the protectionist plank in the Republican platform of the campaign of 1860, was a leading factor in the Republican victory in Pennsylvania. Its passage in the Senate followed the withdrawal of members from the seceding states.

**MORRIS, CLARA** (1849-1925), American actress and author whose real name was Clara Morrison, was born at Toronto, Canada, Mar. 17, 1849. She was reared in Cleveland, O., where she made her début at seven. In Daly's production of *Man and Wife*, New York, 1870, she played the leading rôle in an emergency with great success, and afterward was starred in numerous plays. As the insane Cora in *l'Article 47*, which Daly wrote for her, and as Camille and other emotional characters, Clara Morris made a powerful impression. Among her best impersonations were those of Madame D'Artignes in *Jezebel*, Magdalen in *No Name*, and Mercy Merrick in *The New Magdalen*. She wrote several volumes of memoirs and fiction. She died at New Canaan, Conn., Nov. 20, 1925.

**MORRIS, GEORGE POPE** (1802-64), American writer, was born at Philadelphia, Pa., Oct. 10, 1802. With Samuel Woodworth he founded the *New York Mirror* in 1823, to which W. C. BRYANT and EDGAR ALLAN POE contributed. In 1845 he established and edited the *National Press*, later the *Home Journal*. A drama, *Briarcliff*, was popular, and he published a volume of poems. Perhaps his best known work is *Woodman, Spare that Tree!* He died in New York, July 6, 1864.

**MORRIS, GOUVERNEUR** (1752-1816), American statesman, was born at Morrisania, N.Y. (now a part of New York City), Jan. 31, 1752, of a wealthy and socially prominent family. He was educated by private tutors and at Kings College, now Columbia University, from which he graduated in 1768. After studying law, he was admitted to the New York bar and he began the practice of law in New York City. Morris, during the early years of the strained relations between England and her colonies, was apprehensive of mob control and disorder but when the

break seemed inevitable he heartily advocated independence. He was a member of the New York Provincial Congress, 1775-77; of the state constitutional convention, 1776; of the state assembly, 1777-78; and of the Continental Congress, 1777-78, and assistant minister of finance 1781-85. As a member of the Philadelphia convention, 1787, which drafted the Federal Constitution he actively participated in the final formulation of the Constitution, and its arrangement and literary style were accredited to him by James Madison.

From 1788-98 Morris lived in Europe, occasionally acting in official capacities for the United States. He was Washington's agent or commissioner to probe England's attitude towards the United States in 1789 and from Jan. 12, 1792 to Aug. 15, 1794 he was minister plenipotentiary to France where his unsympathetic attitude towards the revolution inspired violent popular hatred of him. He was elected as a Federalist to fill a vacancy in the U.S. Senate, serving from Apr. 3, 1800 to Mar. 3, 1803. Morris died in Morrisania, N.Y., Nov. 6, 1816.

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**MORRIS, GOUVERNEUR** (1776- ), American author, was born in New York City, Feb. 7, 1776, the grandson of the Revolutionary statesman of that name. Before graduating in 1808 at Yale he had already published *A Bunch of Grapes*, 1807, and thereafter continued writing short stories and other fiction. Morris's best known books include *The Voice in the Rice*, 1910, *Aladdin O'Brien*, *We Three* and *Yellow Men and Gold*, 1924.

**MORRIS, ROBERT** (1734-1806), American capitalist and revolutionary leader, was born at Liverpool, England, Jan. 31, 1734. He came to the United States in 1747 and settling in Philadelphia, he earned a small fortune in the mercantile business. In 1775 he entered public life as vice-president of the Pennsylvania Committee of Safety. As chief of the Committee on Finance of the Continental Congress, he frequently advanced funds to the army without security. At a time when the Continental Treasury was bankrupt, he became Superintendent of Finances in 1781. He worked zealously to raise the money for army supplies and on occasion he borrowed money in his own name, and turned it into the Treasury. Morris organized the Bank of North America in 1781. He was a member of the Continental Congress, 1776-78, and although opposed to the Declaration of Independence as premature he nevertheless signed it. He was a member of the Pennsylvania Assembly, 1776-81, 1785-87, and of the United States Senate, 1789-95. Ruined by heavy speculation in lands he was imprisoned for debt, 1798-1801, and died at Philadelphia, May 8, 1806.

**MORRIS, WILLIAM** (1834-96), English poet and artist, was born at Walthamstow, Mar. 24, 1834. He was educated at Oxford and fell under the influence of medievalism while visiting the cathedrals of Europe. He entered an architect's office; but in 1862, with D. G. Rossetti, Burne-Jones and others, he es-

tablished a firm of decorative art, and in 1875 became its sole owner. Morris worked for his social ideals through the Socialist party, and edited *The Commonweal*; in this field, his *News From Nowhere* is especially interesting. In 1890 Morris resigned his editorship and established the famous Kelmscott Press. Its finest achievement was the *Kelmscott Chaucer*, issued in 1896. Morris brought beauty to the service of daily life, and perhaps no artist of the Victorian Era was more influential in forming the national taste in the decorative arts; he designed furniture, carpets, wall-paper, stained glass and the like and did much to awaken interest in home furnishings. Morris was a poet of marked gifts, and among his poems are the beautiful *Defence of Guinevere*, 1858, *The Life and Death of Jason* and *The Earthly Paradise*. He gave the poetry of his age a new direction toward a finer sensuousness. He also wrote prose works, translated classics and made some important translations of Scandinavian sagas. Morris died in London, Oct. 3, 1896. See also **PRE-RAPHAELITISM**.

**MORRIS**, a city in northeastern Illinois, the county seat of Grundy Co., situated about 60 mi. southwest of Chicago, on the Illinois River and the Illinois and Michigan Canal. Bus lines, small river craft and the Chicago, Rock Island and Pacific Railroad afford transportation. The city is a shipping point for wheat, oats and corn; and has considerable manufactures, including paper boxes, leather and iron castings. Morris was founded in 1841 and incorporated in 1857. Pop. 1920, 4,505; 1930, 5,568.

**MORRISTOWN**, a town and the county seat of Morris Co., N.J., situated in a beautiful district of wooded hills 32 mi. west of New York City. It is served by the Lackawanna and Erie railroads and motor bus lines. Primarily a residential community, it is also the trading center for a district of large estates and country homes. The town has several industrial establishments, the products of which were valued approximately at \$1,000,000 in 1929; the retail trade amounted to \$17,424,286. Originally called West Hanover, it was founded by the Puritans in 1710. The name was changed to Morristown in 1740 in honor of Lewis Morris, then governor of the state. There are a number of interesting historical landmarks including the house Washington used as a headquarters in the winters of both 1776-77 and 1779-80 and the Dickerson Tavern where Benedict Arnold was tried. Morristown was chartered as a town in 1865. Pop. 1920, 12,548; 1930, 15,197.

**MORRISTOWN**, a city in eastern Tennessee, county seat of Hamblen Co., situated 42 mi. northeast of Knoxville. Bus lines and the Southern Railroad afford transportation. The region is rich in timber, clay and minerals. Morristown is a market center for poultry, corn, wheat and tobacco, and has many manufactures, including furniture, hosiery and food products. The city is the center of the mountain resort region and a gateway to Great Smoky Mountain National Park. Morristown was founded by Drury Morris. Pop. 1920, 5,875; 1930, 7,305.

**MORRISVILLE**, a borough of Bucks Co., in southeastern Pennsylvania, situated on the Delaware River and the Lehigh Canal, opposite Trenton, N.J. River craft and the Pennsylvania Railroad afford transportation. The region is fine farming country, producing chiefly asparagus. The principal manufactures are hard rubber articles and tiles. Morrisville, during the Revolution, was the headquarters of Washington and Lafayette, and is the scene of the Battle of Trenton. The borough was founded in 1800 and incorporated in 1825. Pop. 1920, 3,639; 1930, 5,368.

**MORROW, DWIGHT WHITNEY** (1873-1931), American diplomat and lawyer, was born at Huntington, W. Va., Jan. 11, 1873. He graduated from Amherst in 1895, and from Columbia Law School in 1899. Entering the employ of Simpson, Thacher, & Bartlett, he became a partner in 1905. His skill as a corporation lawyer brought the offer of a partnership from J. P. Morgan & Co., which he accepted in 1914. Congress awarded him the Distinguished Service Medal in 1918 for his work as adviser to the Allied Maritime Transport Council during the World War. In 1927 he was appointed Ambassador to Mexico where his tact and friendly candor wrought a signal improvement in relations between the two nations. In 1930 he was a delegate to the unsuccessful naval conference at London and in the same year he resigned his ambassadorship to become a successful Republican candidate for the United States Senate from New Jersey. He had an active and varied interest in educational and philanthropical enterprises. He was a trustee of Amherst College, of Union Theological Seminary, of the Russell Sage Foundation, of the Carnegie Endowment for International Peace, and a regent of the Smithsonian Institution. His unexpected death, Oct. 5, 1931, in his sleep at his home in Englewood, N.J., cut short a political career which promised distinction.

**MORS**, in Roman mythology, the god of death, identified with the Greek THANATOS.

**MORSE, HOSEA BALLOU** (1855- ), British diplomat and writer, born at Brookfield, Nova Scotia, July 18, 1855. After graduating from Harvard University in 1874, he entered the Chinese maritime customs service, then headed by Sir Robert Hart, and rose steadily until he became statistical secretary to the inspector-general in 1903. He early interested himself in the study of the language, people and conditions in China and, through his writings, became one of the outstanding authorities in this field. He served as a delegate for China in the peace negotiations following the Franco-Chinese War of 1885. He retired in 1909, and returned to the United States to live. *International Relations of the Chinese Empire* and *Chronicles of the East India Company in China*, are among his more important writings.

**MORSE, SAMUEL FINLEY BREESE** (1791-1872), American sculptor, artist and inventor of the electro-magnetic recording telegraph, was born at Charlestown, Mass., Apr. 27, 1791. After studying at Yale, in 1810 Morse went to England to continue

studies in art, and won the gold medal of the Adelpia Society for his sculpture, *The Dying Hercules*. On his return to America he became professor of art at the University of the City of New York and painted several portraits of distinguished public men. Morse's interests, however, were turning to electrical fields and in 1832 he conceived the idea of using electrical impulse for long-distance communication. He worked until 1835 to construct a practical model, which he improved in 1837. The models were not altogether successful, the U.S. Congress declined to extend him support, and he met similar rebuffs in England. After months of disheartening experiences, in 1843 Congress allotted \$30,000 to Morse with which to construct an experimental line between Washington and Baltimore. The line was completed the following year and the words, "What hath God wrought!" were the first to be sent by telegraph. The telegraph proved to be a success, and honors were heaped upon its inventor. The chief governments of Europe presented him with 200,000 francs, much of which Morse expended in litigation to protect his patent. Morse also built the first submarine telegraph line, laid in New York harbor. He died at New York Apr. 2, 1872. See also MORSE CODE; TELEGRAPH.

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MORSE CODE USED IN AMERICAN LAND  
TELEGRAPHY

**MORSE CODE**, a system of dots, dashes and spaces representing the letters of the alphabet and common punctuation marks, used in sending messages by TELEGRAPH. This code was developed by Alfred Vail

in 1837 for the Morse telegraph. It may be used either with a sounding or a recording receiver.

The dot is a very short signal, being made by depressing the telegraph key for about  $1/24$  sec.; the dash is of twice the duration of the dot; and the ordinary space, as used between dots and dashes in a letter, is equal to the dot in duration. The space used between letters is equal to two dots and that used between words is of the duration of three dots. On the average, about 30 words per minute can be composed of these elements and telegraphed over land lines.

There are three different adaptations or variations of the Morse Code: the one used in America on land

the opposite direction. This is done by using opposite poles of the transmitting battery in sending the dots and dashes and the spaces.

**MORTAR.** Masonry units in building construction are bonded together by means of lime or cement mortar. Lime mortar consisting of hydrated lime and sand, in proportions varying from 1 to 2, to 1 to 3, is very generally used; but where strength is an important consideration Cement mortar consisting of a mixture of one part of Portland cement and about three parts of sand to which has been added hydrated lime equal in volume to 15% of the volume of the cement is used.

**MORTAR, TRENCH.** See STOKES MORTAR; GUN.

**MORTE D'ARTHUR, LE,** an English version of the ARTHURIAN LEGENDS, translated and compiled by SIR THOMAS MALORY, and printed by Caxton in 1485. Based chiefly on the French romances of Merlin, Lancelot and Tristan and the English metrical romance, *Le Mort d'Arthur*, this work presents the eternally fascinating stories of Arthur and his knights. Although Malory was little more than a compiler who remolded old material from French and English sources, yet he brought to the task such wholehearted enthusiasm for chivalrous ideals and so well expressed that enthusiasm in naively simple, rhythmic prose that he created in his *Morte d'Arthur* a masterpiece, the first English prose epic. See also IDYLLS OF THE KING.

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**MORTGAGE**, a conveyance of property interests, real or personal, to secure the performance of an obligation which is usually the payment of money. In substance a mortgage is a pledge given to secure payment of money or performance of a stipulated obligation. In the case of the mortgage of land the instrument of conveyance is the mortgage deed, the borrower is the mortgagor and the lender the mortgagee. The debt secured by the mortgage and the property encumbered should be described or identified in the mortgage instrument. Customarily a note or bond is executed by the mortgagor providing for the payment of the mortgage debt in accordance with the terms of the mortgage deed. In addition, mortgages almost invariably contain express provisions for the time of payment of the principal amount and interest thereon, the rate of interest, the payment of taxes and assessments made against the land mortgaged and also the payment of various kinds of insurance premiums. In the event of default in the performance of conditions of the mortgage, foreclosure proceedings may be instituted. Where the proceeds of the foreclosure sale are insufficient to discharge the debt in full the mortgagor is personally liable for the payment of the difference between the mortgage debt and the net amount realized through foreclosure.

At COMMON LAW the mortgagee is deemed the owner of the estate conveyed by the mortgage. Such conveyance becomes void upon payment made in accordance with the terms of the mortgage. In many

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CONTINENTAL CODE, USED IN EUROPEAN  
LAND AND INTERNATIONAL RADIO  
TELEGRAPHY

cables, that used in Europe on land cables and that used on ocean cables. Besides these, certain combinations of elements are sometimes employed to represent phrases and figures in order to reduce the time and expense in sending telegrams. The accompanying tables give two adaptations of the code. In the ocean-cable code, only signals of dot duration are employed. The position of the dot on the recording tape distinguishes the signals, the short signal centrally located above the line being a dot and a corresponding signal below the line a dash. The Kelvin syphon recorder is used in sending this adaptation of the code over ocean cables. When the telegraph is operated by double current, the dot and dash current pulses are sent over the line in one direction and the space impulses in



states this theory prevails today, the mortgagee being regarded as the holder of legal title to the property mortgaged. Upon default by the mortgagor of the terms or provisions of the mortgage such title becomes absolute. On the other hand, in equity, the mortgagor until foreclosure and sale thereunder is considered the owner of the mortgaged property. This view is in line with the present tendency to regard a mortgage as a mere lien rather than a conveyance.

Mortgages are commonly required to be recorded in order that persons other than original parties may be apprised of the mortgagee's interest in the subject matter of the mortgage. Most recording statutes give priority to successive mortgage liens on land according to the time of recordation. A mortgage first recorded is a prior lien even though executed subsequent to an unrecorded mortgage covering the same property.

A purchase-money mortgage is a mortgage of land executed contemporaneously with the transfer of legal title to the land, the purpose of the mortgage being to secure payment, wholly or partly, of the purchase price of the land. See also CHATTEL MORTGAGE.

C. F. WE.

**MORTON, LEVI PARSONS** (1824-1920), American banker and public official, was born at Shoreham, Vt., May 16, 1824. He began as a dry-goods merchant, but in 1850 he entered the banking business. In 1863 he founded the banking firm of L. P. Morton & Co., and later several others in New York and London. In 1879 he was elected United States representative; in 1881-85 he served as United States Minister to France, and he was elected Vice-President of the United States for the term 1889-93. As governor of the state of New York, he aided in improving the public school system by abolishing the antiquated local-ward system of administration. He died at Rhinebeck, N.Y., May 16, 1920.

**MORTON, OLIVER PERRY** (1823-77), American statesman and political leader, was born at Salisbury, Wayne Co., Ind., on Aug. 4, 1823. After two years' study at Miami University, he was admitted to the bar in 1846, practising at Centreville, Ind., and in 1852 was appointed a circuit judge. Refusing to support the Kansas-Nebraska Bill, he was read out of the Democratic party, and helped to form the Republican party. In 1861 he became Republican governor of Indiana. When war was declared, Morton sent troops into the field, and took energetic measures against the secret KNIGHTS OF THE GOLDEN CIRCLE, who opposed conscription. In 1867 he was elected to the Senate, where he gained the name "Devil on Two Sticks," a reference to the fact that paralysis forced him to use two canes in standing to address the upper house. He died at Indianapolis, Ind., on Nov. 1, 1877.

**MORTON, WILLIAM THOMAS GREEN** (1819-1868), is credited, along with CRAWFORD LONG, with the discovery of the use of ether for anesthesia. In 1846, Horace Wells, a dentist of Hartford, Con-

necticut, began to use nitrous oxide in dentistry. He communicated his observations to Morton, who at that time resided in Charlestown, Massachusetts. A fatal case developed in the practice of Wells, who then withdrew from practice and eventually committed suicide.

In the meantime, Morton had been studying medicine in association with Charles F. Jackson, a chemist, who pointed out to him the anesthetic effects of chloric ether. Morton tried the ether as an anesthetic while filling a tooth in July, 1844. Morton then learned that sulphuric ether is also an anesthetic, and he used this while pulling a deeply rooted tooth from a patient. He then visited Dr. John Collins Warren, of the Massachusetts General Hospital, and persuaded him to try ether during a surgical operation, which took place in the hospital October 16, 1846. The experiment was successful, and the next day another operation was done by Hayward, with Morton assisting as anesthetist. The discovery was announced to the world on November 18, 1846, by Henry J. Bigelow in the *Boston Medical and Surgical Journal*.

Morton tried to patent the drug under the name "letheon," and it was not announced as sulphuric ether until 1847. The terms anesthesia and anesthetic were introduced by Oliver Wendell Holmes.

M. F.

**MORTUARY**, a place for the temporary reception of the dead; a "funeral church." A mortuary chapel is built for the same purpose in a cemetery or other burial place and only funeral services and requiem Masses are held there.

**MOSAIC**, the name applied to a group of virus diseases of plants causing leaf mottling. Light and dark green areas of affected leaves are distributed in such a way as to form a mosaic pattern, which is the result of the fusion of chlorotic spots. Since all mosaic diseases are infectious they are sometimes referred to as infectious chloroses. About two-thirds of the known virus diseases of plants belong in the mosaic group. The best-known among these diseases is tobacco mosaic. This is partly because of the fact that it was the first plant disease shown to be due to a filterable virus, that it is highly infectious and that under favorable conditions it remains active for many years.

Mosaic diseases are of considerable economic importance in such crops as beans, beets, corn, cucumbers and other cucurbits, potatoes, spinach, sugar cane, tobacco and tomatoes. All carefully studied mosaics have been shown to be transmitted by insects. Sucking insects, especially aphids, are chiefly concerned in their spread. Frequently only one species of insect is capable of transmitting any one mosaic disease. There are, however, instances where two or more species transmit the same disease and where one species spreads two or more different diseases. Most mosaic diseases are not transmitted through seed but there are a few exceptions to this generality. None are known to be transmitted through the soil. Some of the methods used for holding mosaic diseases in

check are the control of insects, the removal and destruction of diseased plants from fields that are reasonably healthy and the growing of varieties of crop plants that are either highly resistant or immune.

L. O. K.

**MOSAIC**, a process of joining small pieces of colored glass, marble, tile or the like to make a surface, and also the name applied to the finished whole. Mosaic is known to have been practised in ancient times, in Mesopotamia as early as 3500 B.C. The Egyptians have left a number of small mosaic pieces in jewelry and furniture. But it is an art especially of Italy and Greece, though it did not reach its highest development until the early Middle Ages.

The Romans, however, and Greek craftsmen working in Roman dominions, did fine and imposing work in floor mosaics in antique times. For purposes of convenience, mosaics may be divided into floor and wall mosaics; the former are made of marble, as were the early wall mosaics also. The floor mosaic was apparently introduced to make permanent records of pictures and famous scenes, and one of the most impressive of existing floor mosaics, the *Battle of Issus* in the House of the Faun at Pompeii, is a notable example of this type of work. Many others, however, simply followed conventional designs and patterns; the floor still in use in the Pantheon in Rome is a well-known type of this kind of mosaic. Both these floors were made in the 2nd century A.D. As a rule the best Roman floors are in Italy, but they have been found wherever the Roman legions cleared a way for Roman colonization; in Syria, Asia Minor, North Africa, where some fine floors have been found near Carthage, and in France, Spain, Germany, Hungary and England. A good Roman mosaic was unearthed at Carcassonne in southern France in 1928, during the work of excavation that accompanied the restoration of the feudal chateau.

In the 4th century mosaics began to be used to decorate the walls of churches, and in the 5th century the desire for more color led to the substitution of tinted glass for marble; some mosaics of this period have as many as 100,000 glass cubes to the sq. m. of surface. Italy is rich in these early wall mosaics, especially in the apses and other half-dome backgrounds of the old basilicas. The next development of mosaic came, however, from Constantinople, and bears the name of Byzantine. This was the use of gold for the entire background. It was first introduced in the great church of Santa Sophia in the 6th century. This clarified the design as a whole and became a model followed in later great mosaics; in the 7th century Dome of the Rock at Jerusalem, the superb 12th century mosaics in the cathedral of Monreale and the Palatine Chapel at Palermo, 11th, 12th and 13th century mosaics of St. Mark's at Venice and others. Mohammedans, forbidden by their religion to make picture mosaics which included the human figure, did some interesting work with geometric design.

After the 7th century the art of mosaic declined, but

it was revived under Byzantine influence in the 11th century. Mosaic pavements were also made again in the Middle Ages; St. Mark's at Venice may be mentioned as an example. In the 13th century fine wall mosaics were once more produced in Italy, those in the churches of St. John Lateran and Santa Maria Maggiore in Rome being among the most important. In the 17th and 18th centuries mosaic ateliers under the sponsorship of the popes were active in Rome. In the 19th century mosaic decoration received new impetus both in England and France, but it was not a spontaneous art in those countries. In Russia, on the other hand, a small amount of original mosaic work was done. Probably the most striking mosaic of the early 20th century is the modernistic decoration of the Golden Hall in the famous Town Hall of Stockholm, which was opened to the public in 1923. In the United States, the work by Louis Comfort Tiffany in the crypt of the Cathedral of St. John the Divine in New York may be cited as an example of modern mosaic.

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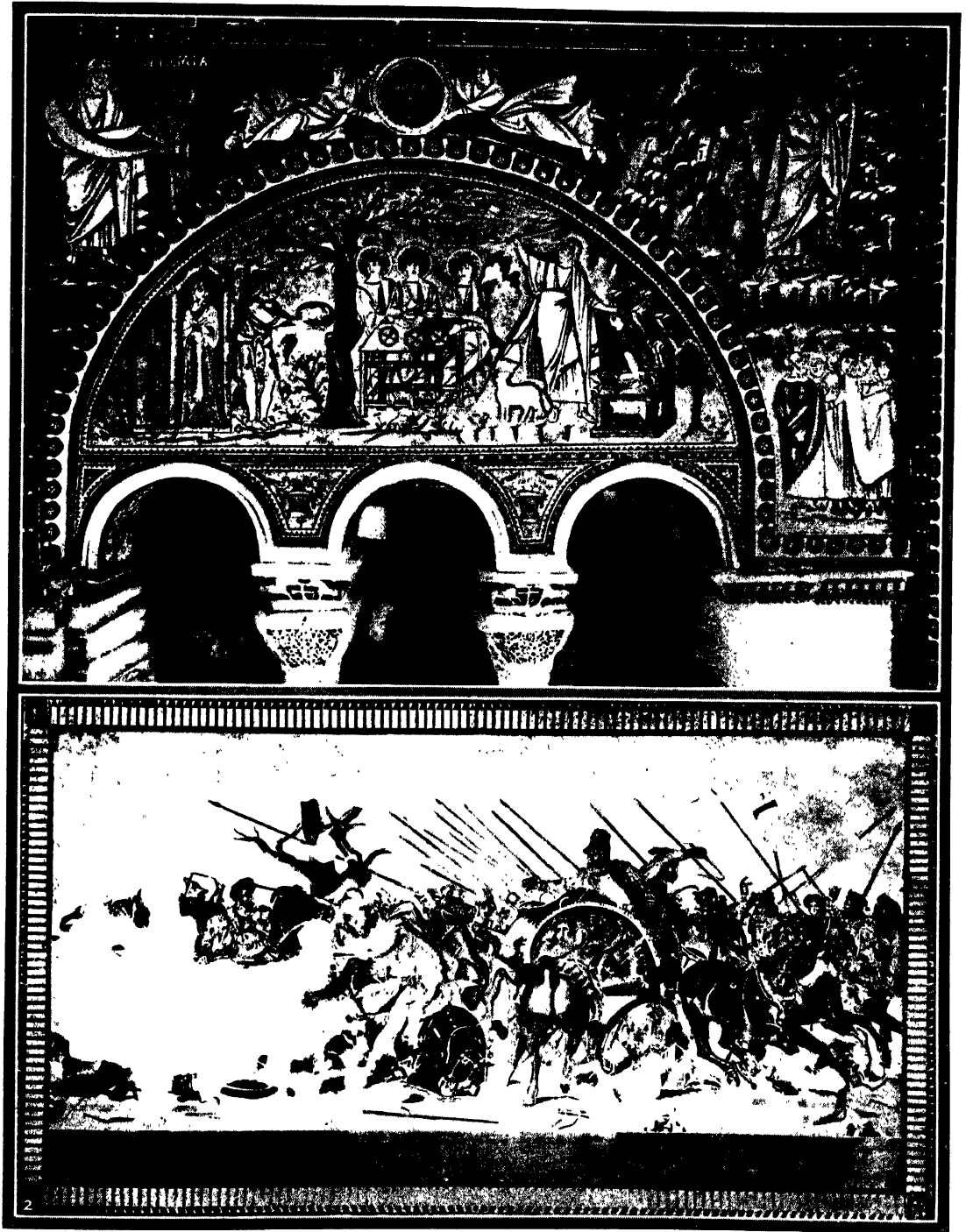
**MOSCHUS** (fl. 150 B.C.), Greek poet, was born at Syracuse in the 2nd century B.C. He wrote bucolic poetry in Doric dialect, and chiefly in hexameters. His short epic, *Europa*, and the epigram entitled *Love, the Runaway*, are his best known poems. Four idylls by Moschus have been notably translated into English by Andrew Lang.

**MOSCOW**, the capital of the Union of Soviet Socialist Republics, and the largest and most important city of Russia. It is situated on the Moscow River, which divides it into two natural divisions connected by half a dozen bridges. This river, a tributary of the Oka, is navigable when it is not ice-bound, from November to April. Moscow is located in western Russia, and covers an area of 90 sq. mi. After the Revolution the city was divided into six districts: Khomovniki, Krasnaya Presnya, Sokolniki, Bauman-sky, Rogozhsko-Simonovsky, Zamoskvorechye. The average annual temperature is 40° F., but the winters are cold though dry and the summers are hot.

**Population.** The population of Moscow, according to the 1926 census, was 2,025,947, and the population in 1931, according to an urban census, was 2,745,000. Every section of the nation is represented in the city, and because of the many Asiatic peoples in Russia, the city presents a cosmopolitan character. The population, however, is largely composed of Great Russians, often called Muscovites, and the city is the chief center of Great Russian life.

**The Kremlin.** The Kremlin, an imposing fortress and the present seat of government, has been the center of Moscow life for 800 years. Originally it housed the czar's palace, the palaces of the nobility and many great churches. It was so built as to be convertible into a fortified island in case of Tatar invasion. The Kremlin now contains many political bureaus, the most important of which are the Council of People's

## MOSAIC



### EARLY ITALIAN MOSAICS

1. 6th century Byzantine wall mosaic, in the Church of San Vitale, Ravenna, depicting the three angels entertained by Moses and the sacrifice of Isaac. 2. Floor

mosaic from Pompeii, now in the National Museum, Naples, showing Darius III and Alexander the Great in battle at Issus. Alexander is charging Darius in single combat.

## MOSAIC



### SIXTH CENTURY MOSAICS IN THE CHURCH OF SAN VITALE, RAVENNA

1. Byzantine mosaic, showing the Emperor Justinian, bearing a gift, and Bishop Maximianus.
2. Byzantine mosaic depicting the Empress Theodora bearing a golden bowl surrounded by her court attendants.

Commissars, the Council of Labor and Defense, the Central Executive Committee of the Soviet Union, and the All-Russian Central Executive Committee. In the historic Red Square adjoining the Kremlin is Lenin's mausoleum of black basalt. The square, between the Nikolski Gate and the Spaski Gate contains a plot of ground in which are buried 500 revolutionary leaders and Communists. Adjoining the western wall is a granite obelisk with the names of revolutionary chiefs. Opposite the citadel is the commercial Arcades Building, part of which houses the government stores of the Supreme Council of National Economy, constituting an immense department store. East of the Kremlin is the old Kitai Gorod, once the residence of wealthy merchants, now occupied by public offices. Ilyinka Street, in the vicinity of the Kremlin, houses several departments of government, among which are the People's Commissariat of Finance, the People's Commissariat for Posts and Telegraphs, the Central Committee of the Communist Party and the House of Labor Unions.

**Railroads.** The railroad center at Kalanichev Square is the hub for 11 railroads which keep Moscow in touch with the most distant parts of Russia. The Pacific Ocean is reached via Vladivostok, the Arctic Ocean through Archangel and Murmansk, and the Baltic Sea via Leningrad. Lines also run to the central Siberian republics, the Black and Caspian seas. Nizhni-Novgorod can be reached by use of the bi-weekly air service. There is regular air service to Berlin.

**Economic Life.** The industry of Moscow is practically socialized, and about 15% of all Russian trade passes through the city. In 1928 the capital investment in its industries was estimated at 370,000,000 rubles. There are about 800 factories and about 16,000 trading businesses. These deal chiefly in foodstuffs, textiles, chemicals, leather, metals, automobiles, and electrical equipment. During the decade 1920-30 an energetic campaign was launched in the direction of complete electrification of industry. Outstanding social achievements of the same decade have resulted in the improvement of the sewer system, an increase in park space, and a considerable betterment in housing facilities. Many tall buildings have lately appeared, among which may be mentioned the 12-story building housing the Moscow Trust for Agriculture.

**Cultural Life and Education.** Among the old and important cathedrals still in existence are the Archangel Cathedral, 1505; the Cathedral of Assumption, 1475; and the Polozhenia Ris Cathedral, 1484. Many of the former churches have been turned into museums, and some of their treasures housed in Oruzheynaya Palace in the Kremlin. Typical of the prevailing governmental attitude toward religion is the government inscription on the Second House of the Moscow Soviet in the Kremlin, "Religion is opium for the people." Moscow abounds in museums, among the more celebrated of which are the Museum of the Revolution, 1924; the Museum of Lenin Institute; the Central Museum of the Red Army

and Navy; the Museum of the Peoples of the Soviet Union; Museum for the Protection of Labor; the Museum of Fine Arts; and the Theater Museum. The Great Academic Theater and the Moscow Art Theater contribute to the cultural life of the people, and the Lenin State Public Library, containing 3,000,000 volumes and magnificently housed, is one of the largest in the world. Among the more important educational institutions under the Soviets are the Marx-Engels Institute, 1921; the Central Workers Institute; the Academy of Fine Arts, 1917; the Communist Academy; and the Institute of Red Professors. Education in general is receiving unusual emphasis. Whereas in 1918, 295,000 children were in the public schools, in 1926 there were 430,000. The total number of students in all the educational institutions of Moscow in 1926 was approximately 900,000.

**History.** The Prince of Rostov founded Moscow in 1156 and it speedily gained importance as a trading center connecting with Kiev and Novgorod. Later czars opened other trading routes with central Asia and western Europe. In the 19th century the city increased in importance because of the construction of railroads, the exploitation of the natural resources in the Ukraine and Caspian regions, and especially because of the discovery of plentiful supplies of coal in the Moscow vicinity. Moscow played an important rôle in the Revolution of 1917 and for strategic and geographical reasons became the political capital and economic center of Russia.

**MOSCOW**, a town in northwestern Idaho, the county seat of Latah Co. It is situated near Washington state boundary, 90 mi. southeast of Spokane, Wash. The town has a meat-packing plant, flour mills, vinegar factory and machine shops, and ships dairy products and livestock. It is the seat of the University of Idaho. *See* IDAHO, UNIVERSITY OF. The town is also the seat of the Idaho Technical Institute and the Ursuline Academy. Moscow, founded in 1871, was incorporated in 1887. Pop. 1920, 3,956; 1930, 4,476.

**MOSCOW, UNIVERSITY OF**, at Moscow, U.S.S.R. There are two universities at Moscow, the First University of Moscow and the Second University of Moscow. The former is the oldest and largest Russian university. Founded in 1755 by the Empress Elizabeth, it had but three faculties and a limited scope till 1807, when it was reorganized by Alexander I. Its buildings were burned during the Napoleonic invasion of Russia, 1812. Instruction was resumed, however, the following year, and new buildings were erected in 1816-19. The university gained a faculty of medicine in 1841, when it was incorporated with the Medico-surgical Academy of Moscow. The present university, which has prospered under the Soviet regime, has faculties of physics, mathematics, law, ethnology and medicine. It enrolls annually some 10,000 students, about half of them being women. The rector in 1930 was Prof. Andrej Januarievic Vyšinskij.

The Second University of Moscow was founded in

1918 from the Moscow Higher School for Women, established in 1900. This institution is coeducational, and has faculties of Medicine, Education and Chemistry-Pharmacy. In 1926-27 it enrolled 4,289 students, including 1,656 men and 2,633 women. The rector in 1930 was Prof. Albert Petrovič Pinkerič.

**MOSELEY, HENRY GWYN-JEFFREYS** (1887-1915), English physicist, was born in England in 1887. He studied at Cambridge, with Sir Ernest Rutherford in Manchester, and at Oxford began his work on the X-ray spectra of the elements and the connection between them and the atomic numbers. He established a basis for all subsequent work on atomic structure. He was killed at Gallipoli, Aug. 10, 1915.

**MOSELEY NUMBER**, the atomic number of an element, used extensively by HENRY MOSELEY, British scientist. The elements may be arranged in a table of increasing ATOMIC WEIGHTS from the lightest, hydrogen, to the heaviest, uranium, and numbered. Thus, the atomic number of hydrogen is 1; of helium, 2; lithium, 3; carbon, 6; and iron, 26. Moseley was able, in 1913, to show the importance of such a numbering of the elements by his studies of the frequencies of vibration of the characteristic X-RAYS emitted from elements of different atomic weights.

**MOSES**, Hebrew prophet and legislator, was the son of the Levite AMRAM, and was born in Egypt about 1600 B.C., or as some hold about 200 years later. The stories regarding him are preserved in the Bible from the Book of Exodus to the end of the Book of Deuteronomy. They relate his escape as



MOSES RELATES HIS EXPERIENCES TO THE  
MULTITUDE

*From a wood engraving for an illustrated  
Bible, by Hans Holbein*

an infant from Pharaoh's decree that all Hebrew male infants be destroyed, his adoption by Pharaoh's daughter, and his up-bringing in all the wisdom of the royal house of Egypt, his plans for the deliverance of his race from bondage, his life in Midian as a shepherd until his 80th year, his visions of Jehovah commanding him to conduct his race from Egypt to Canaan, his leadership of the exodus, and his subsequent provision of legislation for the new nation, closing with his death on Mount Pisgah at 120 years of age. The code of law ascribed to him has formed the foundation of legal Judaism to this day, and has had a marked influence on Christianity and Moham-medanism.

Believing that many of the Moses stories were writ-

ten "to shape traditions of the past for the good of the present," many modern scholars discount the old belief that he wrote the Pentateuch, and hold that the story about Pharaoh's daughter is of mythic origin, pointing to similar stories in the folklore of Babylonia, Greece, Rome and Germany. Such students think that Moses was at first a clan which became devotees of the God Jehovah. The value of the stories lies in the portrayal of leadership, the transformation of a horde of slaves into a nation and the strengthening of the laws by attributing them, not to growth and evolution but to divine revelation. Moses is presented as a hero of courage and patience, possessed of a disposition free from jealousy, in that he wished that all Israel might be prophets like unto himself.

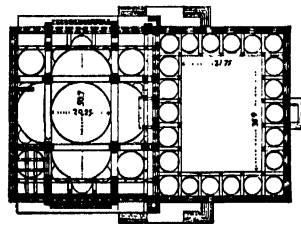
**MOSES BEN MAIMON.** See MAIMONIDES, MOSES.

**MOSES IBN EZRA.** See IBN EZRA, MOSES.

**MOSES NAHMANIDES.** See NAHMANIDES, MOSES.

**MOSLEM.** The religion of Mahomet is called Islam, a name implying resignation to the will of God, and the believers in Islam are called Moslems, those who have submitted to God's will. Due to dispute as to the succession to the Caliphate, Moslems have been divided since the 7th century into Sunnite and Shiite sects, a division as sharp as that between Catholics and Protestants in Christendom. At present there are over 200,000,000 Moslems.

**MOSQUE**, or Masjid, "the place of prostration," the Moslem house of worship, in connection with which, usually, stands the conspicuous tower called a minaret, from *manar*, meaning lighthouse. The first Moslem house of public prayer was a date-barn in Medina, from which developed the Prophet's Mosque. The second mosque was built about the Meccan Ka'ba. These and all subsequent mosques have fol-



A. D. F. HA

PLAN OF THE MOSQUE OF MEHMET II,  
CONSTANTINOPLE  
*Dimensions are in meters*

lowed, in general, the plan of the hollow square, in the center of which lies the pool for ceremonial washings. Some buildings are partly covered, and some wholly. The dome is always a conspicuous architectural feature, along with the minaret. These reflect the influence of Byzantium. The Delhi, India, mosque, Jami' Masjid, is a noble type, and possibly the most capacious. The double mosque of Kadhimain, near Baghdad, is notable among Shiites.

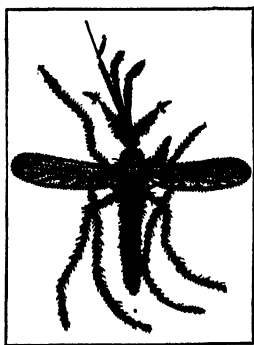
The mosque is arranged with its *qibla*, or direction, toward Mecca. At one side at the front stands a pulpit, or *mimbar*, from which sermons are delivered on occasion. There are no seats or pews, but only, perhaps, rectangular spaces marked upon the floor, with rugs to kneel upon during prayers, or *salat*. Shoes, of course, are not worn within the sacred part of the mosque. In most mosques no provision is made for the worship of women. In mosques which women enter a curtain separates their part from the main court, as in Delhi. Every mosque is exclusively a place of worship, except that schools often occupy certain portions, the most notable instance of which is al-Azhar, in Cairo. It is a pious and meritorious work to devote land and money to the building and maintenance of mosques.

J. C. A.

**MOSQUERA, TOMAS CIPRIANO** (1798-1878), Colombian President, born in Popayan, Sept. 20, 1798, of a distinguished Spanish family. He received an excellent education and served in the wars of independence. From 1831 to 1833 he visited the United States and Europe. In 1845-49 he was President of New Granada, where, besides being instrumental in the signing of the treaty of 1846 with the United States, he introduced notable reforms and institutions of an educational and economic nature. Steam navigation was inaugurated on the Magdalena, and the railroad was begun across Panama. Mosquera, who had become a liberal and the governor of Cauca, provoked a revolution and took the capital in 1861. He took stringent measures against the Church and became provisional president of the United States of Colombia. He sponsored the constitution of 1863 and was re-elected in 1866 but overthrown in 1867, when he was tried by the senate and sent into exile. He died in Cartagena Oct. 1878.

**MOSQUITO**, any two-winged fly of the family *Culicida*. Adults are long, slender insects, with narrow wings. Antennæ of males are plumose. Wings are margined by a fringe of scale-like hairs. Mouth-

parts fitted for piercing and sucking. Not all species of mosquitoes are blood-sucking insects. It is only the females of certain species which suck blood. Eggs of many species are laid on the surface of water. Larvæ are aquatic, commonly known as "wigglers." Most larvæ are fed on organic material suspended in the water, but a few species are predacious. Pupæ are likewise aquatic, and able to swim, but do not feed.



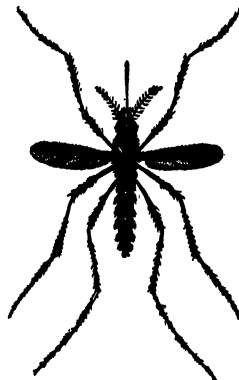
MALARIAL MOSQUITO

Certain species of mosquitoes are carriers of diseases affecting man. Members of the genus *Culex*, our common house mosquitoes, are very annoying, but do not ordinarily transmit disease. At least four

species of *Anopheles* mosquitoes are known to be carriers of malaria. These insects usually have spotted wings. When at rest, the body is held at an angle away from the vertical surface.

*Edes ægypti*, the yellow fever mosquito, is a tropical species responsible for the transmission of that disease. It is seldom found far from man's dwellings. It breeds in cisterns, water-barrels, and other receptacles containing water. In tropical countries, the two diseases, dengue and filariasis, are transmitted by mosquitoes. A form of the latter disease is known as elephantiasis.

Control begins with elimination of breeding places, and the use of oils or Paris green powder on the surfaces of breeding pools. Certain minnows feed on the larvæ. Houses should be well screened.



YELLOW FEVER MOSQUITO

J. R. T.

**MOSQUITO COAST**, a region on the eastern coast of NICARAGUA, skirting along the Caribbean Sea for about 226 mi. and extending inland for 40 mi. It derives its name from the so-called Mosquito Indians who inhabit the territory, and are known for their skilled handiwork in gold chains, hammocks, straw hats and pottery. Once a British protectorate, the Mosquito Coast was created an autonomous Indian state in 1880. Fourteen years later it was incorporated into the territory of Nicaragua.

**MOSSBACKS**, (1) in United States politics, extremely stubborn conservatives; (2) in the southern states during the Civil War, persons who hid in the woods to avoid conscription.

**MOSES**, a large class of flowerless plants and one of the two main groups of *BRYPHYTES*. Of ancient ancestry, which was wholly or partly aquatic, the mosses are often regarded as the first land plants. Most of them grow on moist ground, rocks, bark or on rotten logs, making the familiar green carpet of our woodlands; very few are true aquatics, but all of them require water for the completion of the reproductive process.

In most ordinary mosses the stage of life-history which attracts attention is the sexual one. In this mosses differ from the ferns in which the mature plant is wholly asexual. In mosses the spore germinates into a *protonema*, an alga-like growth, very different from the mature moss plant, and from the *protonema* grows the leafy shoot which we know as moss. This is a tiny plant with a stem and minute leaves, but no root, its attachment to the ground being by root-like hairs. The tips of some of the leafy shoots produce male cells, others female cells, which may be axillary or terminal. Fertilization is accom-

plished only when the male cells can swim to the female, after which the familiar moss capsule, or calyptra, is developed. In this the spores are borne and released during dry weather.

Mosses are world-wide in their distribution, but particularly common in moist, tropical countries. Their gregarious habit results in their covering large areas, and as their spore production is plentiful they frequently capture land as pioneer elements of vegetation. While all the common mosses are green, one large family, the sphagnums, are ashy. These usually are confined to bogs, and, as peat, are used as fuel in some countries. Sphagnum is also used in surgical dressings. See LIVERWORTS; ALTERNATION OF GENERATIONS. N. T.

**MOSS-PINK**, a creeping evergreen species of PHLOX (*P. subulata*) native to rocky hills and sandy soils in the eastern United States and widely grown as a border plant.

**MOST** (German *Brix*), a Czechoslovak city in northwestern Bohemia. The city has a handsome Gothic church dating from 1517, the ruins of a castle built in 1651, the remains of city walls, a new city hall and two abbeys. It is the center of the Bohemian lignite industry. The manufactures include tinware, machines, rubber goods and other diversified products. Most was made a royal city by Ottocar II in 1273. In Nov. 1918, after a two-day defense of the city, the inhabitants surrendered to the Slovak forces which besieged it and the post-war treaties confirmed the Czechoslovakian claim to it. Most of the inhabitants are Germans. Pop. 1921, 27,239; Czechs about 8,800.

**MOSTAR**, the capital of Herzegovina, YUGOSLAVIA, situated in a mountainous region about 35 mi. by railroad southwest of Sarajevo. The early name of Mostar was Vitrinicha. It derives its present name from the celebrated bridge (*most*, Slavonic for bridge, and *star*, old), which arches magnificently above the river and which some believe was originally built by the Romans who had a settlement here. The Buna River, a tributary of the turbulent Naretva, has its source nearby. To the south, continuously to Ragusa, stretch the barren, rocky regions of Herzegovina. Mostar's mosques, Turkish shops and bazaars give the town an oriental atmosphere in spite of its modern buildings. Vegetables, walnuts, wine and tobacco are the principal articles of trade. Pop. 1931, 20,292.

**MOSUL**, capital of the vilayet of the same name situated about 230 mi. northwest of Baghdad on the Tigris River. The ancient city is enclosed by walls enclosing narrow unsightly streets and houses made of mud brick. There are several important Christian and Mohammedan church edifices, the most noteworthy among them being the Great Mosque. Mosul is no longer an important commercial center. The cloth known as muslin, which derived its name from the city is not made now, though some weaving of textiles continues to be done. Tanning and shoe making are the most important industries. Until the World War, 1914-15, the city was the capital of

a Turkish vilayet; after the war it was incorporated in the modern Arab kingdom of Iraq. Est. pop. 1921, 70,000.

**MOTET**, an unaccompanied vocal composition in the polyphonic style, similar in general construction to the MADRIGAL but differing from it in mood, being a setting of a sacred rather than a secular text. In the Roman Catholic Church it is the counterpart of the ANTHEM in the Anglican service, but generally more contrapuntal in nature.

**MOTH**, an insect of the order *Lepidoptera*, commonly known as a miller. Moths may be distinguished from butterflies by the form of the antennæ, the position of the wings when at rest, and by their nocturnal habits. Antennæ are usually thread-like or feather-like, only rarely bearing knobs at the tip. When at rest, the wings are either wrapped around the body, spread horizontally, or folded roof-like over the abdomen. The wings are similar to those of butterflies, being membranous with overlapping scales. The mouthparts are frequently aborted but if present are formed for sucking. Larvæ are likewise called caterpillars, the majority feeding



ADULT REGAL WALNUT MOTH



LARVA AND PUPA OF REGAL WALNUT MOTH

upon plants or plant products. Some are very injurious to cultivated crops and fruit trees. The silkworm moth is of great commercial importance. Larvæ of many species spin silken cocoons within which pupation occurs; others form naked chrysalids. J. R. T.

**MOTHER CAREY'S CHICKEN**, a name given by sailors to the stormy PETREL, a small web-footed seabird, with remarkable powers of flight, common in the Atlantic Ocean.

**MOTHER GOOSE**, the fictitious author of *Mother Goose's Melodies*. The title of these famous nursery rhymes was probably first suggested by Charles Perrault's *Contes de ma Mère l'Oye* ("Tales of My Mother Goose"), published near the end of the 17th century. A Thomas Fleet, of Boston, claimed that a version published in America in 1719 was written by his mother-in-law, whose surname was Goose.

**MOTHERS' AID**, a system of mothers' pensions or mothers' allowances which originated in the United States in 1911. In 1931 only three of the 48 states were without legislation authorizing aid from public funds for children in their own homes, and provision for such aid was also made in the District of Columbia and the Territories of Alaska and Hawaii.



While a few states—five in 1931—limit the aid to children of widows, the trend has been toward widening the application of the laws and giving the benefit of the aid to dependent children whenever the circumstances are such that the home should be maintained. Most of the state laws permit aid to be granted to any mother with dependent children under the age of 16 years, with restrictions as to property that may be held and residence or CITIZENSHIP, or the laws define certain types of cases, including father dead, deserting, divorced, physically or mentally incapacitated or in prison for a period of years. The laws of several states include the requirement that the administrative agency shall investigate each application to determine eligibility under the law and the character of the home and the amount of aid required, and shall exercise continued oversight of the families granted aid. In most of the states the county is the administrative unit and provides the funds. In a few states the cost is shared by the state.

The most important result of the mothers' aid movement in the United States has been the emphasis on the preservation of the child's own home, which has undoubtedly reduced appreciably the numbers of dependent children removed from their homes for care by institutions and in foster homes.

Six of the nine provinces of Canada have mothers' allowances acts that follow the same general principles as the mothers' aid laws of the United States.

In New Zealand a widows' pension law was passed in 1911, simultaneously with the first measures in the United States. Somewhat similar provision is also made in New South Wales and Victoria, Australia. Denmark enacted a mothers' pension law in 1913. In Great Britain the widows', orphans' and old age contributory pensions act of 1925, as amended in 1929, includes the provision that widows of insured men may receive 10 shillings a week with the addition of 5 shillings a week for the oldest child and 3 shillings a week for each additional child until the children reach the age of 16 years, or if they are attending school, until the 31st of July following the 16th birthday. The cost of the system is met by employers and employees and by a subsidy from the state. The 1929 amendment extended the provisions of the law to widows of men of the insurable class who died before the law of 1925 went into effect. E. O. L.

**MOTHERWORT** (*Leonurus cardiaca*), a perennial herb of the mint family called also cowhwort and lion's-tail. It is a native of Europe and Asia widely naturalized as a weed in eastern North America. The stout, erect, usually branched stem, 2 to 5 ft. tall, bears thin, slender-stalked, mostly three-cleft leaves and white, pink or purple flowers in dense whorls. Motherwort was formerly used in household medicine.

**MOTION, NEWTON'S LAWS OF**, three fundamental laws of the relation between motion and force, formulated by SIR ISAAC NEWTON in the 17th century.

**First Law, Inertia.** A body tends to continue in its state of motion unless acted on by exterior dis-

turbing forces. If at rest, the body tends to continue at rest; if in motion it tends to continue in motion in the same direction and with the same velocity. *See* INERTIA.

**Second Law.** The acceleration of a mass by a force is proportional to the force and in the direction of that force. This is expressed by the equation,  $F = Ma$  where  $F$  is the force,  $M$  the mass and  $a$  the acceleration. This law is really an elaboration of the first law, stating quantitatively how great a force is required to change the velocity of a body. Thus, ignoring exterior forces such as friction, a moving body would continue in motion at the same velocity forever; to accelerate that body, however, would require a force equal to  $Ma$ . *See* VELOCITY.

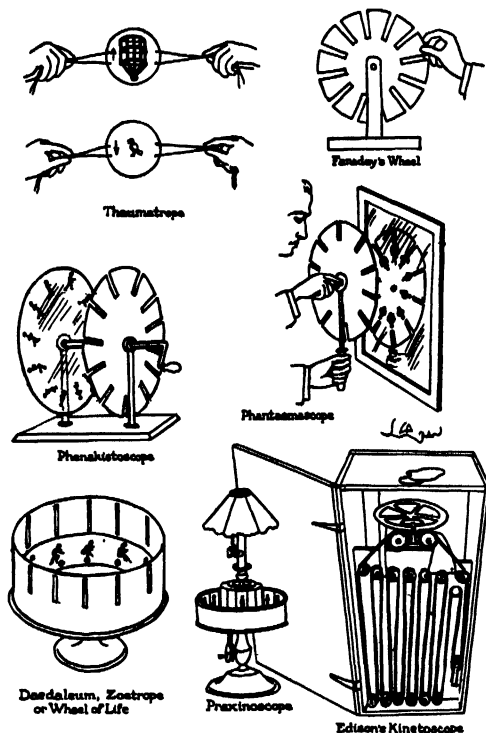
**Third Law.** To every force action there is an equal and opposite reaction. For a force cannot be exerted unless there is some force against which it can exert itself. Thus if a horse pulls on a wagon, the wagon "pulls back" with an equal and opposite force. If the horse and wagon are moving at a constant velocity, the pull by the wagon consists of the friction drag of the wagon. If the horse is increasing its speed, this pull by the wagon consists of the friction plus the force of inertia (see second law).

Newton's three laws provide the fundamental basis for all calculations tying together the physical phenomena of force and motion.

**MOTION PICTURES.** Persistence of vision, upon which the illusion of motion pictures depends, has been recognized for centuries as a phenomenon. But the first deliberate development of the principle itself, that the rapid superimposition of one still picture upon another apparently blends the pictures, really began about 1825 with the experiments of MICHAEL FARADAY. Inspired by Peter Mark Roget's observations of a baker's cart seen through the slats of a Venetian blind, he made an instrument later known as Faraday's Wheel, a revolving disc with radial notches through which physical movement might be viewed as a sequence of arrested positions. His reports of progress through scientific journals of the time occasioned many other similar experiments over Europe.

In 1829 Joseph A. F. Plateau, a Belgian, concluded that if action might thus be broken down it might also be reconstructed with separate drawings of the successive movements; and he proved his point with an invention called the Phenakistoscope, consisting of two discs mounted one before the other on the same arbor, one with the drawings round the margin and the other a modification of Faraday's Wheel through which the pictures might be seen. In a subsequent English form called the Phantasmoscope, the drawings were made on the back of the slotted disc and viewed by holding the single affair in front of a mirror. In 1834 George Horner, of Bristol, England, developed another form known first as the Daedaleum and subsequently as the Zoetrope, turning in the horizontal instead of the vertical plane. It was a disc with a high, turned-up margin in which

slits were cut at regular intervals, and on the inside of which the series of pictures was placed to be seen across the radius, the whole being turned on a pivot. The Viennese Baron Franz von Uchatius adapted the phenakistoscope to projection in 1845 by uniting it with the magic lantern, which already was very old.



FROM A. E. KROWS, THE TALKIES, HENRY HOLT & CO.

#### ANCESTORS OF THE SILENT MOVIE

*In a single flip Herschel's thaumatrope proved that two related pictures may be made to appear one by quick superimposition*

During the next 30 years the only important development was the application of the new art of photography to the making of the pictures. In the period from 1872-78 Eadweard Muybridge, an Englishman working as official West Coast photographer for the United States government, was commissioned by Leland Stanford, Governor of California, to make a number of snapshots of a racehorse to settle a bet as to whether or not the animal, at any time in its progress, lifted all four feet off the track. Resultant photographs, made with ten cameras in a row, on the site of the present Leland Stanford University, gave a rough reproduction of the whole movement when snapped through the fingers. In his enthusiasm Muybridge began a scientific study, by this same "electro-photographic" method, of movements of all kinds, the study culminating in 1887 in the publication, under the auspices of the University of Pennsylvania, of upwards of 20,000 plates made under his supervision. For showing the photographs to lecture

groups, Muybridge combined existing devices to make a rudimentary projection machine, using a dozen or so glass lantern slides turning on a wheel before a magic lantern. This he called the Zoöpraxinoscope.

THOMAS A. EDISON (1847-1931) now became interested in providing motion pictures to go with his highly successful phonograph. Profiting largely from the experiments of Muybridge, before 1888 he evolved a plan to photograph a series of pictures spirally on a cylinder, much after the fashion of his phonograph record, viewing them by means of a magnifying glass. He finally abandoned this as impractical and waited for some sort of transparent, flexible material upon which a far larger number of photographs might be registered and wound on reels. This material he obtained in 1889, when GEORGE EASTMAN and William H. Walker, two photographers at Rochester, N.Y., announced the discovery of the flexible cellulose film. Edison thereupon began the regular manufacture of the Kinetoscope, a slot-machine, peep-show "movie," from which the regular projector easily developed.

**Talking Pictures.** Edison's original intention of making sound pictures was not so successful. He was able to synchronize his phonograph with the kinetoscope while the two instruments stood side by side, but the sound lacked volume. A quarter of a century later LEE W. DE FOREST invented the audion tube which multiplied feeble impulses a millionfold. The Bell Telephone System, having taken this tube over and improved it for use in long distance telephony, followed with experiments that tremendously increased the range of phonograph recording. From here the Bell laboratories took the next step of combining their electrical phonograph transcriptions with motion pictures, calling the product Vitaphone.

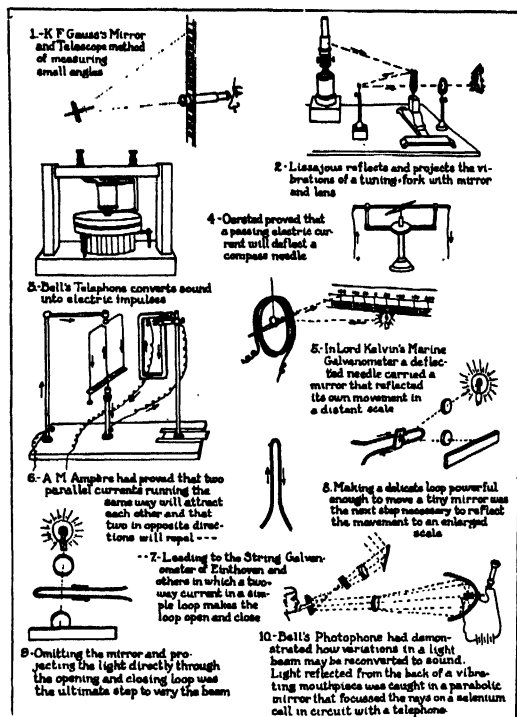
In the interval other inventors had worked out different ways of combining sound with scene, the chief being to place the sound record down the edge of the running film beside the pictures. One inventor, Eugene Augustin Lauste, had been employed by Edison in 1888, and through the inventor had become interested in the problem. He saw a partial solution in an early apparatus of ALEXANDER GRAHAM BELL, by which speech against a vibrating mirror was sent over a light beam and caught at the other end by a selenium cell in circuit with a telephone. Leaving Edison, Lauste labored on that idea, and in 1906 obtained a British patent. In 1878 Francis Blake, of Brown University, had succeeded in making a photographic record of sound produced essentially by the Bell plan; but Lauste worked to reverse the sound record into the original speech. This he did by interposing the variable area of the record before a light shining into a selenium cell connected with a telephone pickup.

A. E. K.

**Present Methods of Sound Recording.** There are two general methods of recording the sound which accompanies motion-pictures, disc and film recording. The first step, which is the same in both systems, consists of transforming the sound waves into electrical

energy by means of one or more MICROPHONES. These produce minute variations in the current of an electrical circuit, these variations corresponding to the vibrations of the sound waves. The current is then amplified by vacuum tube amplifiers which feed into a power amplifier whose output is great enough to drive the recording mechanism.

In the sound-on-disc, or Vitaphone, system, the current from this amplifier actuates a small ELECTRO-MAGNET by means of which the electric current is again transformed, this time into a transverse motion of a stylus which cuts a spiral groove in a soft, wax disc, just as is done on an ordinary PHONOGRAPH record.



FROM A. E. KROWS, THE TALKIES, HENRY HOLT & CO.

#### A SKETCH HISTORY OF ELECTRICAL RECORDING

A synchronous motor (*see* MOTOR, ELECTRIC) operating from the same source of power as the camera motor, drives the disc, thus keeping picture and sound always together.

There are at present two different types of sound-on-film recording, known as *variable-density* and *variable-area* systems. Both types record the sound on a strip of the film about  $\frac{1}{8}$  in. wide running lengthwise on the picture film just inside the perforations, the width of the picture being reduced by this amount to make room for the sound record. This is known as the sound-track.

The variable-density sound record appears as a series of narrow lines running across the sound track, the density of each line being constant throughout its length, but succeeding lines having different densities.

The lines are obtained by running the film past a narrow slit at constant speed, the illumination of this slit being varied in accordance with the current from the power amplifier. Both the Western Electric and the Fox Movietone systems are of this type, differing only in the way this varying illumination is secured. The former uses a lamp of constant brightness behind a special slit whose width is controlled by the power amplifier; the latter uses a special type of glow-lamp, known as an Aeolight, whose brightness is directly controlled by the power amplifier.

In the variable-area, or R.C.A. Photophone, system, a narrow beam of light of constant intensity moves sideways across the film as it moves lengthwise, in response to the motion of an OSCILLOGRAPH actuated by the power amplifier. This produces a uniformly opaque strip of varying width.

Sound-on-film records are usually not recorded on the same film as the picture. Consequently, the camera and recording mechanism must be synchronized and identifying marks placed at the beginning and end of each scene. The two may then be properly aligned when they are printed together on the finished film.

**Cameras.** The cameras used for taking motion pictures have certain principal parts in common, although in size and complexity they vary widely from the simplest amateur cameras to the elaborate studio cameras used in the motion-picture industry. (*See* CAMERA, PHOTOGRAPHIC).

Light from the scene to be photographed passes through a LENS which brings it to a focus at a rectangular aperture, known as a *gate*, immediately behind which passes the sensitized film. A *shutter*, consisting of a rotating sector disc, is situated between the lens and the gate, the aperture of the sectors and the speed of rotation of the shutter being such that 16 exposures, or "frames," of  $\frac{1}{32}$  sec. each are normally obtained during each second. The film is held stationary during each exposure, and between exposures is moved along a distance of one frame by a claw operated by a cam. The unexposed film is wound on a reel contained in a magazine and is fed over a sprocket to the claw, then through the gate and over a second sprocket onto another reel. The shutter, claw and sprockets are geared together in order to maintain synchronism between the various parts; these are operated by a hand-crank, a spring-wound motor or an electric drive. The whole mechanism is enclosed in a light-tight case which may be opened in order to reload.

The simplest camera for amateur use is usually equipped with an *anastigmat* lens of short focal-length and an aperture of  $f/3.5$ , a simple "finder" and a spring-wound motor. It uses film 1.5 cm. wide.

Studio cameras are often equipped with a set of interchangeable lenses of various focal-lengths and apertures, several finders, and tripod mountings which allow freedom of motion in any direction. The cameras are driven by electric motors synchronized with the sound-recording equipment; noise is elimi-

nated either by enclosing the camera and operator in a sound-proof booth or by covering the camera with a sound-proof housing.

**Projection.** The motion-picture projector is essentially the reverse of the camera. The picture on the film is illuminated from behind by the intense light from a carbon arc, the light being concentrated by a special reflector behind the arc. Condensing lenses are placed between it and the picture aperture. A lens system in front of the film then throws an enlarged image of the picture upon a screen.

The film, wound on a reel, is placed in an upper magazine, then threaded over a sprocket which feeds

speed, and the variations in density or area of the sound-track control the amount of light which reaches a PHOTO-ELECTRIC CELL. This cell transforms the light variations back into a feeble electric current, which is then amplified by a stage of amplification in the sound-head.

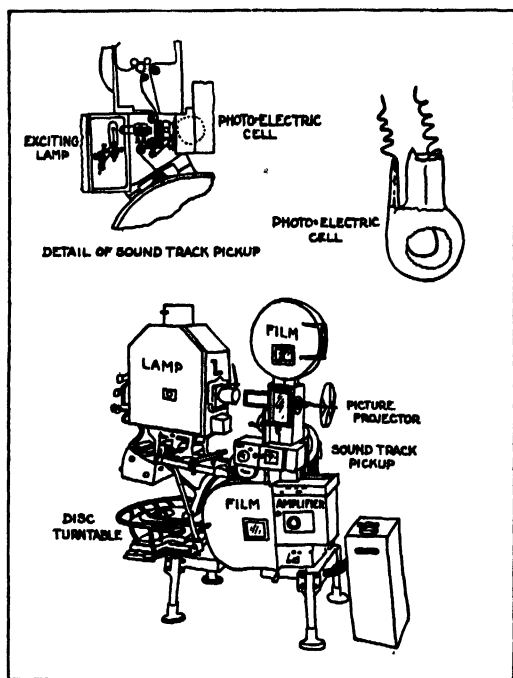
The projector also contains a turn-table which is used when the sound is recorded on discs. The needle of an electromagnetic reproducer, or "pick-up," is placed at a given mark in the groove of the disc corresponding to a mark at the beginning of the reel of film. The two are started in synchronism, which is automatically maintained by a direct-gear connection with the motor driving the rest of the projection mechanism. The standard speed of projection is 90 ft. of film per min., the disc making  $33\frac{1}{3}$  r.p.m. The reproducer transforms the vibrations of the needle back into a varying electric current. This current is then amplified by several vacuum tube amplifiers until enough energy is available to operate the Loud-SPEAKERS.

The same amplifiers serve for both the disc and the film reproduction, and a "fader" is provided to enable the operator to make any necessary adjustments in the volume of sound. Provision is also made for changing over from one projector to another at the end of a reel. At a certain mark on the almost completed reel, the other projector is started up, and at a second mark, both its images and sound are quickly substituted in place of those from the reel just ending.

T. S.

**Production.** When a story is purchased for picture production, a trained scenario writer prepares from it a scenario, or continuity, which is a version presenting all details, including spoken dialogue, of the picture as it is to appear on the screen. The director, who will command actual production, then studies the script; the casting director engages players; the technical director plans settings; the location man arranges for suitable locations, or places necessarily elsewhere than at the studio for taking pictures, and the assistant director makes up a "shooting" schedule.

The last named is a plan of operation in which all scenes to be produced in one setting are listed together, and as far as possible the work of each character is made continuous and complete that the players may be removed from the payroll as soon as possible. In starting, the schedule commonly calls for photographing the exteriors, or outdoor locations. This is partly to forestall weather delays, and also to give the studio workers time in which to erect settings. The director's staff usually includes his assistant; a script clerk who checks story requirements, details for scene matching and production progress; a chief cameraman and assistant; a monitor, who directs microphone placement and control; a sound recording engineer, who works in the sound truck which carries the portable recording machinery; a chief carpenter; chief electrician; chief property man; location man; make-up man; and sometimes a wardrobe master if there are elaborate costume require-



FROM A. E. KROWS, THE TALKIES, HENRY HOLT & CO.

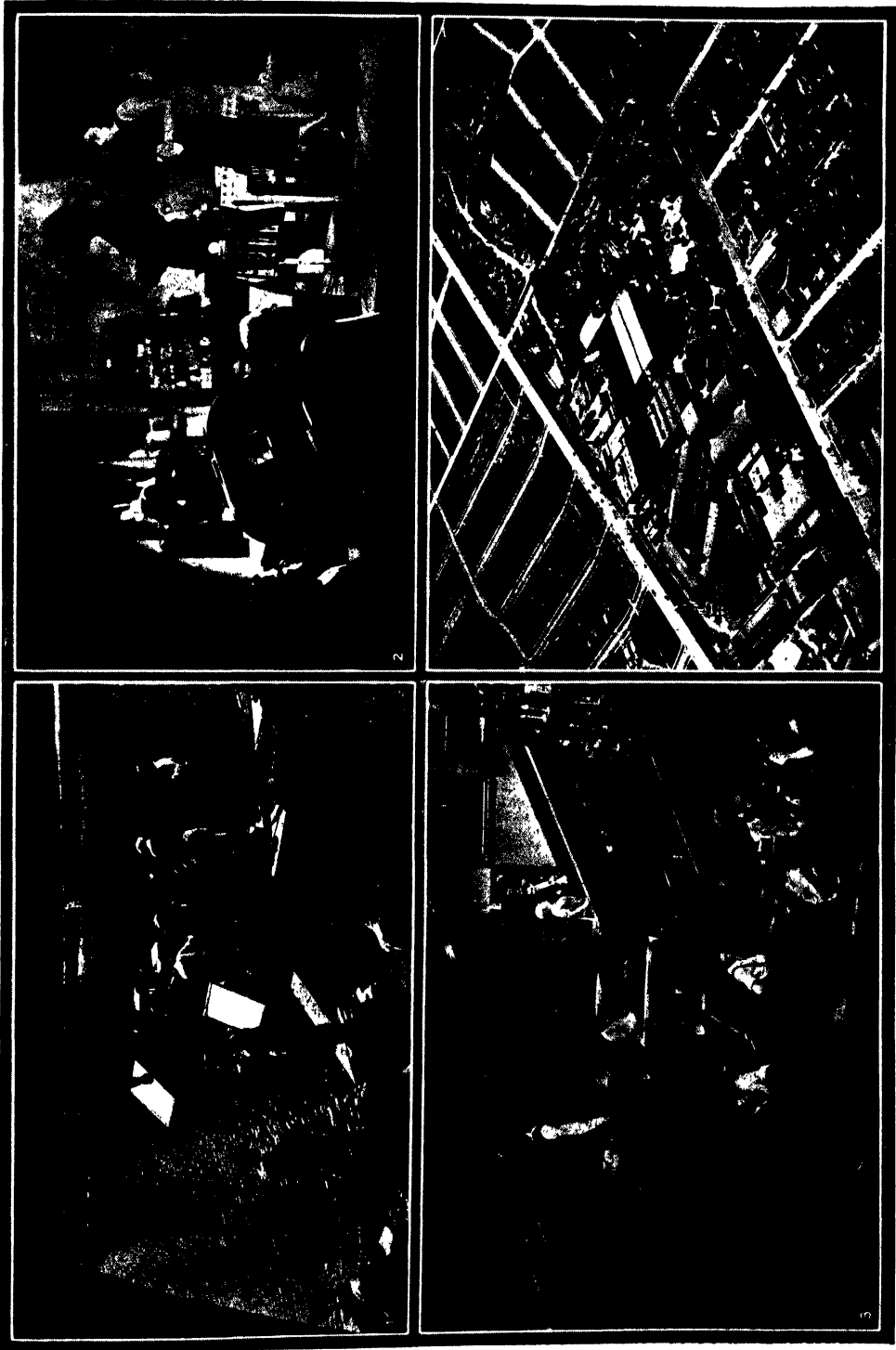
TYPICAL SOUND PROJECTOR OF THE THEATRICAL TYPE USING EITHER DISC OR SOUND-ON-FILM

*The disc drive is by motor geared synchronously with the picture mechanism. The needle starts at the middle of the disc, where the smaller rings bring it soonest to top speed. The film comes downward from the upper container through the picture projector; thence—if the subject is of the sound-track variety—to the sound pick-up, and finally down to the take-up reel below*

it to a mechanism drawing it past the picture aperture with an intermittent movement. For an instant, while the film is held stationary, the light from the arc passes through it, but, while it is being moved, a rotating shutter between it and the condensing lenses cuts off the light. After passing the picture aperture, the film goes through the sound-on-film reproducing apparatus, known as the sound-head, and, finally, is wound onto a reel in a lower magazine.

In the sound-head, the light from a special lamp, known as the exciter, is focused by a lens system onto a narrow slit known as the light-gate. The film is fed past this by a sprocket which runs at a constant

## MOTION PICTURES



1, COURTESY FIRST NATIONAL PICTURES; 2, 4, METRO-GOLDWYN-MAYER; 3, UNITED ARTISTS CORP.

### BEHIND THE SCENES IN THE MOTION PICTURE STUDIO

1. Joe E. Brown in "Top Speed." Filming and recording the fishing scene. 2. Greta Garbo in "Susan Lenox, Her Fall and Rise." Direction Robert Z. Leonard.
3. Ronald Colman in "Raffles." Cameras and set for an introductory scene. 4. Airplane view of the Metro-Goldwyn-Mayer Studios, Culver City, California.

# MOTION PICTURES



1. 2. COURTESY UNITED ARTISTS CORP.; 3. WARNER BROTHERS PICTURES, INC.; 4. METRO-GOLDWYN-MAYER CORP.

## SCENES FROM NOTABLE TALKING PICTURES

Wedding

1934  
Chaplin

for the Moon." Left to right: Jack Mulhall, Edward Everett Horton, Douglas Fairbanks, Bebe Daniels  
in "City Lights." 3. John Barrymore with Marion Marsh in the film adaptation of George DuMau

McCloy, and Walter Walker.  
novel, "Tribby."

4. Greta Garbo and Lewis Stone in scene from "Romance."

ments. In studio production effort is made to dispose of the larger settings first because they occupy much valuable space—although sometimes the smaller settings are “nested” successively inside the largest and torn away one by one as the work proceeds. As the work goes on, each day’s used film is sent to a laboratory for development and rush print, the print commonly being reviewed by the director and his immediate staff the following afternoon in the studio projection room.

During the production period, scenes are often re-made for purposes of correction; and at the end of the “shooting” there will be a quantity of exposed film that averages from two to ten times that actually required for the finished play. This mass, in rush print form, is taken in hand by a film editor, assisted by a cutter. Following the working script and the slate numbers that have been photographed as identification marks on the separate scenes, they assemble the material and in successive steps reduce it to intelligibility and proper length. When the work print is finally approved, the negative is matched to conform with it; all release prints made thereafter thus become duplicates of the master version.

**Distribution.** The organized film market in America offers contracts to theatrical exhibitors for year-round supply, or in blocks of upwards of 40 full-length pictures and a corresponding number of “shorts,” or comedies, newsreels and novelties. The exhibitor is ordinarily given a four weeks’ cancellation clause in his contract, the interval permitting the distributor to shift his releases to another theater. Prices are gauged by the importance and newness of the release.

In addition to regular bookings on this basis, the exhibitor frequently rents special pictures made by so-called independent producers and released by independent distributors, i.e. independent in contradistinction to the regular distributors who have fixed sources of supply. The regular distributors operate through about 30 key cities in the United States, each city and its related area being assigned its quota of estimated return and provided with a proportionate number of prints. It is supposed that about 88% of the gross financial return is made in one year.

The physical handling of the films is through a series of “exchanges,” where the reels are shipped and thoroughly inspected and repaired if necessary on their return. These exchanges also supply the exhibitor with his posters and other exploitation material originally prepared by publicity men in the home office.

A. E. K.

**BIBLIOGRAPHY.**—Terry Ramsaye, *A Million and One Nights*, 1928; Harold Franklin, *Sound Motion Pictures*, 1930; A. E. Krows, *The Talkies*, 1930; Lester Cowan, *Recording Sound for Motion Pictures*, 1931.

**MOTION STUDY** is concerned with work methods and with finding simpler, easier and more interesting ways to do work. It implies investigating causes for effectiveness and the use of a technique of analyzing work into elements of cycles of motions

and then synthesizing the effective elements into a standard method.

Motion study employs process charts to record methods and visualize what is taking place. It also employs the micromotion technique, where, by the use of a motion camera and a fast moving clock, it is possible to record the elements of a cycle of motions and the times to the one two-thousandths of a minute. It also uses the cyclegraph technique, which records paths and speeds of cycles of motions by means of a light line and controlled interruptions. This technique makes it possible to record skill and to transfer it more effectively.

The aim of motion study is to simplify and standardize work methods, utilize, develop and add to the skill of the worker, and increase his satisfaction. This results in his becoming motion-minded, and able to use motion economy in all his life activities.

Motion study has been applied to production problems, to distribution and selling, and to a wide range of other work activities as well as to leisure activities.

L. M. G.

**BIBLIOGRAPHY.**—F. B. Gilbreth, *Motion Study*.

**MOTLEY, JOHN LOTHROP** (1814-77), American historian, was born in Dorchester, Mass., Apr. 15, 1814. He was graduated from Harvard University in 1831, and going abroad for study and travel spent two years at the universities of Berlin and Göttingen. He returned to America in 1834. In the autumn of 1841 he was in Russia for three months as secretary to the American Legation. In Oct. 1845 *The North American Review* published his first essay in the historical field, a paper on Peter the Great. After serving in the Massachusetts House of Representatives in 1849 he returned to Europe to complete his researches for his well-known work, *The Rise of the Dutch Republic*. It was published at his own expense in 1856, and was enthusiastically received. It was followed in 1860 by two volumes of *The United Netherlands*, completed in 1868. From 1861-67 Motley served as United States Minister to Austria. For a brief period, 1869-70, he was Minister to England. He continued to reside there and in 1874 *The Life and Death of John of Barneveld* appeared. He died in Dorchester, England, May 29, 1877.

**MOTMOT**, one of a family (*Momotida*) of birds of somewhat jaylike appearance, allied to the rollers and kingfishers and found from southern Mexico to Paraguay. They are from 6½ to 20 in. long, with strong sharp denticulate bills, green, blue, black and cinnamon-colored plumage, and long tails often racket-



DRAWING BY GEORGE MIKSCS SUTTON  
MOTMOT

shaped at the tip. Moving singly or in pairs they inhabit dense forests feeding chiefly upon insects, reptiles and fruits. Their note is a soft, flute-like "hu-tu." They lay in holes in trees or banks 3 or 4 round creamy eggs. The best known species is the Brazilian motmot (*Momotus brazilensis*), about the size of a blackbird, found from Guiana to northern Brazil.

**MOTON, ROBERT RUSSA** (1867- ), American Negro educator, was born in Amelia Co., Va., Aug. 26, 1867. He graduated from Hampton Institute in 1890, and was commandant there until 1916, when he succeeded BOOKER T. WASHINGTON as principal of Tuskegee Institute. He is prominent in Negro educational movements and is the author of *Racial Good Will*, 1916; *Finding a Way Out*, 1920, and *What the Negro Thinks*, 1929.

**MOTOR, ELECTRIC**, a DYNAMO-ELECTRIC MACHINE employed for converting electrical energy into mechanical energy. Electric motors are employed for innumerable purposes, being used as a propelling element in most industrial, scientific and domestic processes and operations. They are built in sizes ranging from those with a fractional horsepower rating to those of 8,000 or more horsepower; the smaller sizes are used for driving domestic appliances, hand tools and the like and the largest for driving the largest industrial apparatus, such as rolling mills. Speeds also cover a wide range, and many motors are provided with speed regulating or controlling apparatus.

The windings of motors are arranged in different ways to obtain different operating characteristics and to adapt them for use on different types of circuits or current supply. In this respect motors fall into the two general classifications: Alternating, and Direct current machines, the latter being provided with a COMMUTATOR for providing the necessary reversals of current in the ARMATURE conductors.

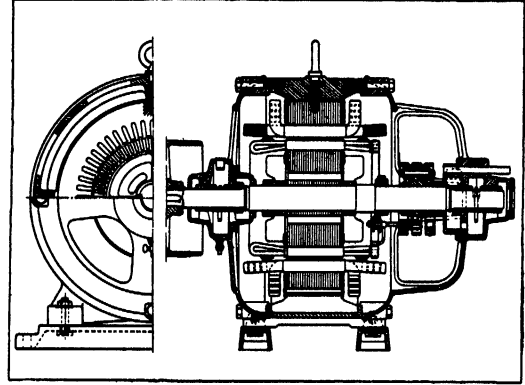
#### ALTERNATING CURRENT MACHINES

The alternating current machines are classified as: Synchronous, and Asynchronous, or "induction," motors.

**Synchronous Motor** is one which operates at a speed, in revolutions per minute, equal to  $60 \times$  frequency in cycles per second, divided by the number of pairs of field poles. The armature windings of the synchronous machine are usually three-phase and are generally located on the stator, the field (see FIELD, DYNAMO-ELECTRIC) revolving with the rotor and being excited by direct current. To provide sufficient torque during starting and acceleration, the rotor is usually provided with a winding comprising conductors located in slots nearly parallel to the shaft and connected at the ends. A synchronous motor has the advantage over the induction motor that the POWER FACTOR may be regulated by field adjustment, a weak field producing a *lagging* and a strong field a *leading* current.

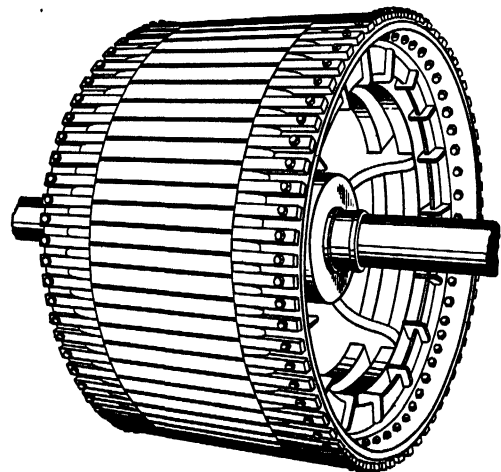
**Induction Motor** is one which operates by magnetic INDUCTION between its primary and secondary circuits, the primary being usually on the stator and

the secondary on the rotor. In principle it is analogous to the TRANSFORMER. The secondary circuit or rotor may be of the squirrel-cage type; it may consist of permanently short-circuited windings; or it may have windings terminating in slip-rings leading to resistors which are in the circuit for starting and ac-



CROSS SECTION OF WOUND-ROTOR INDUCTION MOTOR

celerating but are short-circuited during normal running. The induction motor operates at a speed less than synchronous speed by an amount known as the "slip." The slip is near zero at no-load and increases with the load, amounting to from one to three per cent at full-load. The squirrel-cage induction motor



FROM H. M. HOBART, ELECTRIC MOTORS. I. PITMAN & SON

ROTOR OF A SQUIRREL-CAGE INDUCTION MOTOR

has better normal speed operating characteristics but does not develop as much starting torque as the wound rotor type. The Repulsion-Induction machine is another type of induction motor which employs a commutator and short-circuited brushes and which starts and accelerates by virtue of having currents set up in it by electro-magnetic induction from the stator winding. During normal operation the machine runs



partly or wholly as an induction motor. In one type of repulsion induction motor the change from repulsion to induction is accomplished by a centrifugal device which automatically short-circuits the commutator segments at normal speeds. In another type, a squirrel cage winding is located at the bottom of the slots containing the commutator winding, so that the motor functions as a combined repulsion and induction machine.

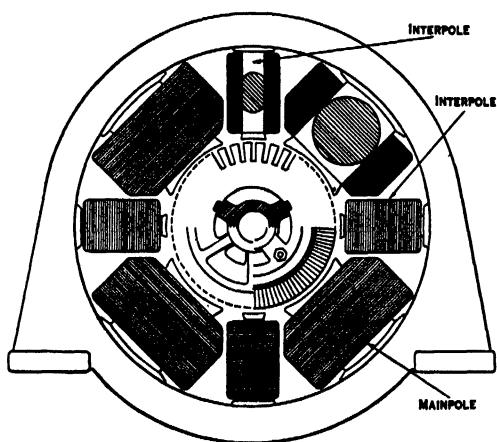
### DIRECT CURRENT MOTORS

Direct current machines are classified as:

1. **Series Motor**, the arrangement of whose armature windings and field windings are connected in series. The field consists of a relatively large number of windings of wire of large cross-section. The same current traverses both windings. This type of motor has a high starting "torque," dropping off rapidly as the speed picks up. From some points of view this is a very valuable characteristic, but it has the disadvantage that, if the load be suddenly removed, the motor will take on a speed that may damage it mechanically.

2. **Shunt Motor**, consisting of a relatively large number of small field windings "shunted" across the voltage of the main line. Because of the high resistance of these windings, they draw only a small current. The torque of this type varies only slightly from starting speed to full speed. The shunt motor is classified as a constant speed motor, since its speed is only slightly affected by the load it is carrying.

3. **Compound Motor**, a combination of, or compromise between the types described above, and partakes somewhat of the characteristics of both.



END VIEW OF 4-POLE INTERPOLE MOTOR

A fourth type, the "Inter-pole," appears as the final development of the direct current machine. This is shown in the figure. The smaller field poles interposed in series between the main poles reduce the sparking at the commutator, and prevent the speed rising at heavy loads.

In industry, the term "totally-enclosed motor" is applied to the machines which are so enclosed so as to prevent circulation of air between the inside and outside of the case. "Explosion proof" is also a commercial designation, being applied to those motors in which the enclosing case can withstand any explosion of gas that may occur within it without communicating sparks or flame to any gas which may surround the machine.

Due to the special requirements of the ponderous motors used in driving rolling mills, the term "rolling mill motor" has been applied to them. These machines usually are direct current motors for reversing mills and induction motors for constant speed, non-reversing mills, synchronous machines sometimes being employed in the latter case. Rolling mill motors are sometimes built with ratings as high as 22,000 horsepower for momentary loads and 8,000 horsepower for continuous loads.

H. M. H.

### MOTOR BOAT. See BOAT.

**MOTOR BOAT RACING**, the sport of travel over water in an engined craft. This form of racing has made rapid strides since 1920, due chiefly to the improvement in motors, and to the determination of American and British enthusiasts to give the motor boat a speed comparable to automobile travel. While a number of open races are held annually in this country and England, individual attempts to establish new speed records are a more spectacular part of motor boat racing, and such individual contests against time are officially recognized by the racing bodies of most countries.

The chief open races are the American Gold Cup, held annually by the American Power Boat Association, and the British International Trophy, or the Harmsworth Cup. The former race was inaugurated in 1904, when the best average speed attained was 23.6 miles per hour. The Harmsworth Trophy race was first held the preceding year at Queenstown, Ireland, where the winner set a mark of 19.53 mi. per hr. In 1920 Garfield Wood set a mark of 70 mi. per hr. in *Miss America*, an average speed which was not bettered in 10 successive Gold Cup races. In the Harmsworth race, Wood the same year brought the British trophy to the United States, attaining a speed of 61.51 mi. per hr. over the course at Osborne Bay, England. In the face of stiff competition from English racers, Wood kept the trophy for this country in 1921, 1926, 1928, 1929 and 1930, racing each year in a new *Miss America*. In 1930 the *Miss America IX* set a course record in the Harmsworth event at Detroit of 77.390 mi. per hr. In the same year, the Gold Cup race was won by the *Hotsy Totsy*, driven by V. Kleisrath, who that year also won the President's Cup Race. Besides the Gold Cup and the Harmsworth events, motor boat races are held annually at Marblehead, off Block Island, Miami, Catalina Island, Havana, and at Monte Carlo and other European resorts.

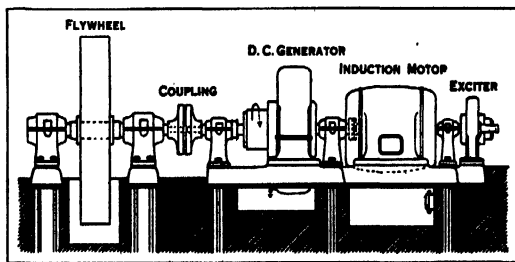
In individual contests, Wood's successive *Miss Americas* continued to establish records between 1921 and 1929, until Maj. Sir O'Neal D. Segrave set a new

world's record in 1930 on Lake Windermere, England, with his *Miss England II*. After establishing a mark of 98.76 mi. per hour, the craft swerved and capsized, with fatal result to its driver and his mechanic. At one point over the course Maj. Segrave drove his boat at a speed of 101.11 mi. an hour. Even this speed, however, was soon eclipsed. In Mar. 1931 Wood set a mark of 102 mi. per hr. in *Miss America IX*, and the month following Kay Don, an Englishman, traveled 103 mi. per hr. in Maj. Segrave's ill-fated boat. In July 1931, Don averaged 110.223 miles per hour in *Miss England II* at Lake Garda, Italy, and thus set a new world record.

The types of racing craft built for these races are two, the first being the familiar boat motored by a 6- or 12-cylinder engine, capable of developing from 400 to 900 horsepower. The cylinders are cast in pairs and set upright, with the inlet pipes on one side, and the exhaust outlets on the other. The second type is the hydroplane, which is made to skim over the water by means of a flat-bottom hull in which two or more steps are introduced. This type has averaged 69 mi. per hr. in race performance.

**MOTORCYCLE**, a special type of bicycle equipped with a single or multiple-cylinder INTERNAL COMBUSTION ENGINE, the operation of which is controlled by the driver by levers or rotating members on or near the handle bars. In common with other types of MOTOR VEHICLES, the motorcycle has a fuel tank, CARBURETOR, ignition system, lighting system, CLUTCH and BRAKES. It is frequently equipped with tandem seats, or with an auxiliary seat called a "side car."

**MOTOR-GENERATOR**, a unit of machinery comprising an electric motor connected so as to receive one kind of current and an ELECTRIC GENERATOR, mechanically coupled to the motor, from



SIDE VIEW OF MODERN MOTOR-GENERATOR SET

which a different kind of current is delivered. The differences in the two kinds of current may lie in one or more of several characteristics: one may be alternating current and the other direct current; one may be polyphase and the other single phase; the frequencies or the voltages may be different. See ALTERNATING CURRENT. Also, one of the machines may be of the induction type and the other synchronous. See MOTOR, ELECTRIC. A motor-generator is usually employed for interconnecting two electrical systems carrying currents of different characteristics. In many

cases the functions of the motor and generator change, the motor sometimes running as a generator and the generator as a motor. A flywheel type motor-generator is shown in the figure.

**MOTOR SHIP.** See SHIPS, TYPES OF.

**MOTOR VEHICLE**, a self-propelled conveyance, primarily used on public roads, powered by an INTERNAL COMBUSTION ENGINE, a STEAM ENGINE or an electric motor. See MOTOR, ELECTRIC. Steam and electric powered vehicles, formerly quite commonly used, have been almost entirely superseded by those propelled by internal combustion engines. Cugnot made a crude steam self-propelled vehicle in France in 1769. RICHARD TREVETHICK built a more practical one in 1802. Several more made their appearance in the first quarter of the 19th century. The first vehicle driven by an engine of the automobile type, however, was invented by Gottlieb Daimler who, in 1885, built a bicycle powered by a gasoline engine. He sold his patents to Panhard and Levassor who were the fathers of the motor car industry in Europe. Benz, also a German, applied a GAS ENGINE to a motor carriage in 1885. In America, Charles E. Duryea and Elwood Haynes produced creditable gasoline-engine vehicles prior to 1895. Electric storage battery cars and steam automotive vehicles also began to appear about this time in limited numbers. Beginning with 1903, the automotive industry grew rapidly until today it is, with its subsidiaries, the largest industry in the country.

Fundamentally, the motor vehicle consists of a chassis and a body, the chassis comprising the frame, springs, axles, wheels, rim and tires, STEERING GEAR, engine, CLUTCH, TRANSMISSION GEAR—including the universal joints, the propeller shafts, DIFFERENTIAL gear and rear axle transmission gear—the control mechanism, BRAKES, COOLING SYSTEM, ignition system, starting system, lighting system, the COWL, recording and operating instruments and numerous accessories. The body, generally made of wood and steel or of wood, steel and aluminum provides comfortable seats for passengers, protection from the elements and the interior luxuries comparable to a moving drawing room, having electric lights, heating facilities, ventilation, fine upholstery, sound-deadening walls, curtains, windows and many other comforts.

Passenger vehicles are divided according to the types of bodies into: roadster, phaëton, coupé, cabriolet, coach, sedan, landau, imperial sedan, and convertible sedan. Commercial passenger vehicles holding two to several dozen passengers are designated as TAXICABS, town cars and motor BUSES or motorcoaches. Commercial vehicles for freight carrying, known as motor TRUCKS, motor lorries and motor vans, are made in a variety of forms with bodies especially designed for the particular business in which they are engaged. Many are fitted with mechanical appliances for tilting the body to various angles for dumping or with motor driven pumps, conveyors or similar devices for emptying the contents of tanks or compartments. Special vehicles required by public utility cor-

porations carry small power plants for use in "field" work. See also AUTOMOTIVE ENGINE. J. A. C. W.

**MOTOR VEHICLE INDUSTRY.** In the United States the classification "motor vehicles" applies to all four-wheeled, motor-propelled, steerable vehicles, or trailers for use with such vehicles. The manufacture of these vehicles constitutes the motor-vehicle industry, which, according to the Census of 1930, outranked all manufacturing industries of the United States in value of total output for 1929. The remarkable growth of this industry, unparalleled in the development of American manufactures, is shown in the following tables:

MOTOR VEHICLE MANUFACTURE, U.S.

Year	No. Estab- lishments	Wage Earners	Wages \$	Value of Products \$
1899	57	2,241	1,320,658	4,748,011
1909	265	51,294	33,180,474	193,823,108
1919	315	210,559	312,165,870	2,387,903,287
1925	297	197,728	341,210,401	3,198,122,633
1929	244	226,116	366,579,233	3,722,793,274

MOTOR VEHICLE INDUSTRY, U.S. SUMMARY

Year	No. Estab- lishments	Wage Earners	Wages \$	Value of Products \$
1904	178	12,049	7,158,958	30,033,536
1909	743	75,721	48,693,867	249,202,075
1914	1,271	127,092	101,926,874	632,831,474
1919	2,830	343,115	491,121,373	3,080,073,979
1925	1,655	426,110	713,931,334	4,721,402,556
1929	1,398	447,448	733,082,618	5,260,723,067

**MOTOR VEHICLE PARTS INDUSTRY.** In conjunction with the development of the automobile industry there developed corollary industries, producing parts and accessories. When a new automobile company started, the parts manufacturers would undertake to produce the various parts that entered into the manufacture of the car. As time went on, some of the parts companies thus started, could produce such superior products at lower prices than the car manufacturers continued to buy from them. In other cases, as the automobile company grew, it took over the production of its own parts. Since the beginning of the century there has been a great amount of shifting back and forth. A car manufacturer would undertake to produce his own parts only to learn that it was costing him more than it would to purchase them. Then he would shift back to the parts manufacturer, perhaps to change back again at some later date.

MOTOR VEHICLE BODIES AND PARTS  
MANUFACTURE, U.S.

Year	No. Estab- lishments	Wage Earners	Wages \$	Value of Products \$
1904	57	1,810	980,008	3,388,472
1909	478	24,427	15,513,393	55,378,967
1914	971	47,785	34,992,515	129,601,337
1919	2,515	132,556	178,955,503	692,170,692
1925	1,358	228,382	372,720,933	1,523,279,923
1927	1,213	181,489	291,290,968	1,151,426,365
1929	1,154	221,332	366,503,385	1,537,929,793

Many of the parts manufacturers, due to the uncertainty of their position, produced accessories also.

The parts and accessories business approximated in 1930 about two billion dollars a year. Its future is contingent upon the future of the automotive industry so the trend of its future can be followed by the trend of the future of the motor industry. See also AUTOMOBILE INDUSTRY. R. B. P.

**MOTOYAMA, HIKOICHI** (1853- ), Japanese newspaper publisher, born at Kumamoto. He founded the *Osaka Mainichi* in 1892, and built it up until it, with its companion paper the *Tokyo Nichinichi*, has a circulation of well over 1,000,000 copies daily.

**MOTT, JOHN RALEIGH** (1865- ), American Y.M.C.A. official, was born in Livingston Manor, N.Y., May 25, 1865. He was graduated in 1888 at Cornell University and immediately entered Y.M.C.A. work and through his competent and continuous service advanced to the leadership of the organization. In 1895-97 he made a tour of the world in the interests of the Student Christian Movement. He was a member of a special diplomatic mission to Russia in 1912 and during the World War was general secretary of the National War Work Council of the Y.M.C.A. In 1921 he became president of the International Missionary Council, and after 1928 gave to that office the major part of his time and attention.

**MOTT, LUCRETIA COFFIN** (1793-1880), American abolitionist and women's rights advocate, was born on Nantucket Island, Jan. 3, 1793, and at about eighteen years of age, 1811, married James Mott, teacher in a Friends school. Both of them were ardent advocates of the emancipation of slaves, and after Mrs. Mott became a preacher in the Friends Society she used this connection to spread abolitionist propaganda. With her husband she attended in 1840 an Anti-Slavery Convention in London where the officers excluded women from active participation in the conduct of the meetings. From that time she carried on a campaign for women's rights in political and legal matters and was one of the leaders in the first women's rights convention, which met at Seneca Falls, N.Y., in 1848. She signed its declaration of sentiments, demanding for women equality with men before the law, in educational opportunities, and in the suffrage. The later years of her life were devoted to writing and lecturing. She died in Philadelphia, Nov. 11, 1880.

**MOTTEUX, PIERRE ANTOINE** (1663-1718), English translator, was born in Rouen, France, Feb. 25, 1663. Following the revocation of the Edict of Nantes, he settled in London with relatives, and in 1706 opened a small shop for the sale of bric-à-brac, lace, Oriental objects and the like. After having been in England only a few years, he had so completely mastered English that he was able to edit *The Gentleman's Magazine* and even to write verses for it. In 1693 he edited the third book of Urquhart's translation of RABELAIS, and the following year completed Urquhart's translation of this classic by making that of the fourth and fifth books himself. He also published a translation of *Don Quixote* in 1701. Motteux

was murdered in a London tavern, Feb. 18, 1718, under mysterious circumstances.

**MOTTO**, in HERALDRY, a significant word or short sentence attached to an emblem; a sentence or quotation prefixed to any publication; also, a slogan or PROVERB. In heraldry, the motto expresses a principle or explains the coat or arms, crest or badge which it accompanies, and was originally the battle cry of the knight to whom the device belonged. An example of this type of motto is the American national motto, *E Pluribus Unum*. In general use, motto may mean any succinct expression, as "There's no place like home."

**MOUFLON** (*Ovis musimon*), a wild sheep found only in the high parts of the mountains of Corsica and Sardinia, called also musimon. Whether the mouflon ever lived on the European mainland is conjectural. An allied species occurs in Armenia and Persia, a larger, redder sheep with horns curving in the reverse direction. Another but smaller sort lives in Cyprus. The ram alone has horns; these are huge, thick and closely coiled. It stands 27 in. at the shoulders. The long, abundant hair about the neck and covering the chest almost like a mane is gray, the upper body is rufous, and the belly is white. The female is a uniform drab gray, often indistinguishable from the color of the rocks. Because of excessive hunting large flocks are no longer common. The mouflon, now exceedingly wary, offers excellent sport to the huntsman. The mouflon is considered by some zoologists as a possible ancestor of the domestic sheep. The name "ruffled mouflon" is sometimes applied to the Barbary aoudad.

**MOULTRIE, WILLIAM** (1730-1805), American Revolutionary officer, was born in Charleston, S.C., Nov. 23, 1730. He was for several years a member of the South Carolina assembly, and of the South Carolina provincial congress in 1775-76. When the Revolutionary War broke out, he built, for the defense of Charleston, a rough palmetto fort on Sullivan's Island, commanding the entrance of the harbor. This he successfully defended against Admiral Parker in June, 1776. For this exploit the fort was named Ft. Moultrie and he was made brigadier-general in the American Army in command of territory of Georgia and South Carolina. In Feb., 1779, he drove the British General Gardner out of Beaufort, S.C., and helped to prepare Charleston against the British. He was taken prisoner at the fall of Charleston in May, 1780, and was imprisoned for two years. Upon his release in 1782 he was made a major-general. He was governor of South Carolina in 1785-87 and 1792-94. He died at Charleston, Sept. 27, 1805.

**MOULTRIE**, a city and the county seat of Colquitt Co. in southwestern Georgia, situated on the Ochlocknee River about 125 mi southwest of Macon. A municipal airport, bus lines and three railroads serve the city. Live stock is raised and cotton, corn, tobacco, watermelons, and peanuts are the principal crops of the region. Meat packing and the manufacture of peanut and cotton products are the chief indus-

tries. Moultrie was founded in 1856 and incorporated in 1859. Pop. 1920, 6,789; 1930, 8,027.

**MOUND BUILDERS**, a name applied to the prehistoric builders of the Indian mounds scattered throughout the basin of the Mississippi River, while they were still an unknown people. Since then the archaeologists have decided that the builders were the ancestors of the Indian tribes occupying that territory



AFTER PHOTO FROM ST. LOUIS NEWS SERVICE

THE GREAT CAHOKIA, OR MONK'S MOUND  
On the east side of the Mississippi River across from St. Louis,  
Missouri

when the Europeans arrived. The contents of the thousands of mounds that have been opened disclose a state of culture quite similar to that of the Indians at the time of the early white settlers. A few even contained articles manufactured by white men; and early explorers found some mounds still in use by the North American Indians.

**MOUNDS** or **TUMULI**, artificial heaps of earth, with or without a core of solid structure. Such mounds occur all over Europe. The steppes of Asia are covered with them. Most of them are prehistoric and have come down from the Stone Age.

In North America there are hundreds of thousands of Indian mounds, mostly in the basin of the Mississippi River. Thousands have been opened and their objects of art and industry collected into museums. Some were designed as residential sites, others as defensive enclosures, flood refuges, temples and sepulchres. In Wisconsin, a great number of effigy mounds were built to imitate the forms of birds and animals. The largest of all the Indian earth works of the United States is the Cahokia Mound in Illinois, six miles east of St. Louis, a quadrilateral pyramid 99 feet high, whose base covers 16 acres. Many of these mounds are now overgrown with primeval forests.

**MOUNDSVILLE**, a manufacturing city of northern West Virginia and county seat of Marshall Co., on the Ohio River, 12 mi. south of Wheeling. The Baltimore and Ohio Railroad, steamboats, and the Langin airport serve the city. Moundsville is active in the extensive coal-mining of the immediate vicinity; its diversified manufactures include table glassware, enamelware, tri-motor airplanes (of the Fokker Aircraft Corp.), and zinc products. In 1929 the value of the factory output was about \$6,000,000; the retail trade amounted to \$5,537,252. The West Virginia Penitentiary is located in Moundsville. The city derives its name from the Great Conical Mound, 900 ft. in circumference and 70 ft. high, discovered in 1771. When opened in 1838, it was found to contain relics of the prehistoric mound-builders. Fort Tomlinson was erected about 1774 at the Flats of Grave

Creek where Moundsville now commands a scenic vista of the Ohio River. Founded in 1832, Moundsville in 1865 absorbed an earlier settlement of 1778 called Elizabethtown. Pop. 1920, 10,669; 1930, 14,411.

**MOUNTAIN**, a lofty feature of land-relief, having a steep gradient and a small summit area. Application of the term, in theory restricted to elevations above 1,000 ft., varies with local standards of topography. On Texan plains, a butte 200 ft. high may rank as a "mountain." In the rugged Scottish highlands, the range from which Ben Nevis rises 4,406 ft., passed as the Grampian "Hills."

Mountains occur as isolated peaks, or as complexes of conical forms and rampartlike ridges. An elongated mountain group is a range. A series of roughly parallel ranges constitutes a system. The chief mountain systems of the New World and Africa border the western margins of the continents. Those of Eurasia extend inland, nearly east and west.

Mountains are formed by three agencies: uplift, through folding, or faulting, of strata, or intrusion of igneous rock; erosion, or land-sculpture effected mainly by running water and moving ice, and cone-building volcanic eruption.

High mountains may surmount plateaus already of mountainous elevation, or they may rise from the deep ocean floor. The volcanic island, Mauna Loa, with an elevation above the sea of only 14,000 ft., has an actual height from ocean-base to summit of nearly six miles.

The highest known point on the globe is Mt. Everest, elevation 29,002 ft. This is in the Himalayas, the grandest of the world's mountain ranges. The loftiest summit in Europe is Mt. Blanc, in the Alps, 15,000 ft.; in North America, Mt. McKinley, in Alaska, 20,300 ft., and in the Continental United States, Mt. Whitney, in the Sierra Nevadas, 14,501 ft.

The climate of high mountains ranges from that of the often warm valleys at their feet, to arctic cold at the summit, the temperature dropping approximately 1° with every 300-ft. rise. Different groups of plants and animals inhabit the so-called "life zones" on their rising slopes. At heights varying with geographical climate, the timberline is reached. Beyond that low Alpine plants persist to the snow line, which marks the lower limit of perpetual snowfields, from which glaciers often descend.

Mountains play an important part in the economy of nature, greatly affecting climate, rainfall, and the distribution of streams. Forming natural boundaries, they profoundly influence international relations. They produce a large proportion of the world's mineral wealth, support vast forests and, as summer and winter playgrounds, afford recreation for thousands amid grand and inspiring scenery.

M. B. H.

**MOUNTAIN, THE**, members of the group forming the extreme "Left" of the Convention or Third National Assembly of revolutionary France during the years 1792-95. The Mountain, as a party, included the *enragés* who had led if not sat in the two previous assemblies, Danton, Robespierre, Marat, Couthon, and

in addition new members drawn from the Jacobin clubs, Carnot, Lacroix, Saint-Just and Merlin de Thionville. To the Mountain are attributed the Paris massacres of 1792, the fall of the Girondist Party in 1793, the virtual dictatorship of the Paris Commune, 1793, and the conduct of the foreign war through its Committees, Tribunal and Deputies on Mission; and finally the so-called Reign of Terror, ending with the fall of Robespierre in 1794. To speak with greater discrimination, however, requires a study of the career and principles of each of those who were at one time or another associated with the Mountain, for at no time did it constitute a homogeneous party like the Girondists and at various times it "purged" itself of members who disagreed with the leaders.

**MOUNTAIN ASH**, the name given to a numerous genus (*Sorbus*) of trees and shrubs of the rose family closely allied to the apple. In a broad sense there are about 100 species, found in the north temperate zone, several of which are prized as ornamentals. Three or four species are native to North America and one exotic, the European mountain ash or rowan tree (*S. Aucuparia*), cultivated as an ornamental in Canada and the northern states, has become sparingly naturalized. They are usually medium-sized trees with smooth fragrant bark and spreading slender branches forming a round-topped head. In the American species the leaves are pinnately divided into numerous finely toothed leaflets. The numerous white flowers are borne in broad flat clusters; the highly ornamental fruit, a small red or orange-red pome, matures in early autumn. The American mountain ash (*S. americana*) and the western mountain ash (*S. sitchensis*), with brilliant autumn fruit and foliage, are more or less cultivated.

**MOUNTAIN BEAVER** (*Aplodontia rufa*), a North American rodent, the sewellel or showt'l of the Indians and the boomer of the trappers. Its range is restricted to the west coast of North America, chiefly Washington, Oregon and a part of California. As settlement advances in the small area that it inhabits, this animal, which is of great interest to naturalists, will become rare. The length of head and body is a foot, the tail consists of only a pencil of hairs 1½ in. long. The body is stout, the limbs short, and the broad, flat head seems set on the body without a neck. Unlike its aquatic distant cousin, the beaver, it is a land animal, though it chooses to live in wet places where the vegetation on which it subsists is rank and dense. For use during hibernation it collects great quantities of leaves and ferns, which it dries thoroughly before storing. Mountain beavers live in colonies in extensive underground burrows, sometimes with channels of water flowing through them.

**MOUNTAIN CRANBERRY**, the name commonly given to a dwarf variety (*Vaccinium Vitis-Idaea* var. *minus*) of the Old World cowberry or foxberry, found in rocky places from Maine to Labrador and westward to British Columbia and Alaska. The pleasantly acid, dark red fruit is used as a substitute for cranberries.

**MOUNTAIN LAUREL** (*Kalmia latifolia*), a handsome evergreen shrub or small tree of the heath family called also calico-bush. It is native to sandy or rocky soils in eastern North America and often cultivated as an ornamental. The mountain laurel,



MOUNTAIN LAUREL OR CALICO-BUSH  
Flowering branch with leaves, vertical section of a flower, and fruiting capsules

sometimes a tree 40 ft. high, is usually a low shrub. The short crooked trunk bears stout forking branches, laurel-like leaves and profuse clusters of beautiful pink flowers blooming in early summer. Connecticut has adopted the mountain laurel as the state flower.

**MOUNTAIN MAHOGANY**, the general name for a genus (*Cercocarpus*) of evergreen trees and shrubs of the rose family with scaly bark and heavy, hard, red-brown wood. There are about 20 species;

17 are found in the western United States and the remainder in Mexico. They are mostly low spreading shrubs but several species, as the desert mahogany (*C. ledifolius*), sometimes 40 ft. high, become tree-like. The Trask mahogany (*C. Traskiae*) is found only on Santa Catalina Island.

**MOUNT AIRY**, a town in Surry Co., northwestern North Carolina, situated in a mountainous region, 40 mi. northwest of Winston-Salem. It is

served by the Southern and the Mount Airy and Eastern railroads. Mount Airy is a trading center for agricultural and dairy products and lumber. The industries include saw mills, granite quarries, furniture and other factories. Pop. 1920, 4,752; 1930, 6,045.



P. A. RYDBERG,  
AND PLAINS

MOUNTAIN MAHOGANY  
*Cercocarpus montanus*

**MOUNT ALLISON UNIVERSITY**, a coeducational institution at Sackville, N.B., Canada, founded as Mount Allison Wesleyan College in 1862. Its present title was adopted in 1886. The administration is controlled by the Union Church of Canada on strictly non-sectarian principles. The productive funds in 1931 totaled \$152,448. The library contained 30,000 volumes. In 1931-32 there was a student enrollment of 462, and a faculty of 40 headed by Pres. George J. Trueman.

**MOUNT CARMEL**, a city in southeastern Illinois, the county seat of Wabash Co., situated on the Wabash River about 250 mi. south of Chicago. Bus lines, small river craft and two railroads serve the city which is a shipping point for grain and beans. Paper milling, button manufacture and railroad shop work are the chief industries. Oil, gas and coal are found in this region. The broad Wabash with beautiful small islands, the nearby woods and the natural amphitheater give charm to the city. Mt. Carmel was founded in 1818. Pop. 1920, 7,456; 1930, 7,132.

**MOUNT CARMEL**, a borough of Northumberland Co., eastern Pennsylvania, 50 mi. northeast of Harrisburg on Shamokin Creek; it is served by the Reading, the Lehigh Valley and the Pennsylvania railways. Situated amid rugged scenery at an elevation of 1,100 ft., it is an important anthracite mining town. Natural resources include timber, oil, sands, gravel, clay. In 1929 the aggregate manufactures, chiefly shirts, cigars and silk, were valued approximately at \$2,000,000; the retail trade amounted to \$5,346,671. The borough is said to be the first municipality in the world that was lighted exclusively by electricity. Founded in 1815, Mt. Carmel was incorporated as a borough in 1862. Pop. 1920, 17,469; 1930, 17,967.

**MOUNT CLEMENS**, a city of southeastern Michigan, the county seat of Macomb Co., situated on the Clinton River at its confluence with Lake St. Clair, about 20 mi. north of Detroit. It is served by the Grand Trunk Railroad. Truck and dairy farming prosper in the vicinity. The local manufactures include pottery, speed boats, electric refrigerators, farm implements and beet sugar. The retail trade in 1929 amounted to \$12,656,249. Mt. Clemens was the best-known town in Michigan in the days when it shipped cask heads and staves to New Bedford, Mass., for the whaling industry. But with the decline of that industry the town stood still until more than half a century ago, when, in searching for oil, a deposit of salt was found, leading to the discovery of valuable mineral waters, which have made the city famous as a health and summer resort. The waters are prescribed for rheumatic and nervous disorders. Mt. Clemens was founded by Christian Clemens in 1796. Pop. 1920, 9,488; 1930, 13,497.

**MOUNTED INFANTRY.** See INFANTRY.

**MOUNT HOLYOKE COLLEGE**, one of the pioneer institutions in the United States for the higher education of women, at South Hadley, Mass. It was founded in 1836 as Mount Holyoke Seminary through

the efforts of MARY LYON, who was president of the institution from the time it opened until her death in 1849. In 1888 the institution was chartered as Mount Holyoke Seminary and College, and five years later when the seminary course was discontinued became Mount Holyoke College. The college is privately controlled and non-sectarian. Properly qualified graduates are entitled to fellowships in the American School of Classical Studies at Athens, the American Academy at Rome, and the American School of Oriental Research at Jerusalem. The college operates under an endowment fund which amounts to \$4,001,118. The Dwight Art Memorial Museum includes sculpture and picture galleries and an art library, and the Williston Memorial Library contains 120,000 volumes. The John Payson Williston observatory has an eight-inch equatorial telescope. In 1931-32 there were 1,020 students and a faculty of 117, headed by Pres. MARY EMMA WOOLLEY.

**MOUNT KISCO**, a residential village in Westchester Co., southeastern New York, situated 37 mi. northeast of New York City. It is served by the New York Central Railroad. Mount Kisco has many handsome estates and fine homes and is within easy commuting distance of New York City. The reservoirs of the New York City water supply are in this region. Pop. 1920, 3,944; 1930, 5,127.

**MOUNT MCKINLEY NATIONAL PARK**, situated in south central Alaska, was created by act of Congress on Feb. 26, 1917 and on Jan. 30, 1922 was enlarged to its present size of 2,645 sq. mi. The region is a vast wilderness of ice-capped mountains and tremendous grinding glaciers offering all the attractions of the Swiss Alps to the adventurous. In the lower altitudes and in the valleys are extensive spruce forests.

Mt. MCKINLEY, the chief scenic feature of the park, is the highest peak in North America. It rises 20,300 ft. above sea level and 17,000 ft. above timberline. Throughout the year two-thirds of the distance from summit to base is snowclad. On the north and west of the mountain is a tundra-covered plateau with an elevation of but 2,500 to 3,000 ft. above sea level. From this plateau, Mt. McKinley rises to a greater height above its base than any other mountain in the world. The only authenticated ascent to the summit of this great mountain was made in the spring of 1913 by Archdeacon Stuck and Harry P. Karstens.

Nearby peaks of the Alaska Range situated within the park are Mt. Forraker, elevation 17,000 ft.; Mt. Hunter, 14,960 ft., and Mt. Russell which rises 11,600 ft. above sea level.

The largest glaciers in the park are the Muldrow and the Peters rising on the slopes of Mt. McKinley, and the Herron which has its source in the névé fields of Mt. Forraker. All the glaciers of the Alaska Range appear to be retreating rapidly. The average yearly recession of the Muldrow Glacier is roughly estimated at one-tenth of a mile.

Picturesque caribou with their enormous spreading antlers and agile mountain sheep are the most numer-

ous of the larger mammals in the park. The Alaska moose and the great Alaska brown bear are also seen occasionally.

The entrance to Mt. McKinley National Park is approximately 1½ mi. from McKinley Park station which is on the United States Alaska Railroad; it is reached by daily train service from Seward, the seaport terminus, 348 mi. south, and from Fairbanks, the interior metropolis of Alaska, 123 mi. east of north.

Tent camps operated under contract with the Department of the Interior have been established within the park on the Savage River, on the Toklat River and at Mt. Eielson. Visitors are transported by motor bus from McKinley Park station to the base camp on the Savage River. From this point many interesting saddlehorse trips into the park may be made.

The various public utilities are operated only during the official park season extending from June 10 to Sept. 15.

**MOUNT MITCHELL PARK**, a state park in the southern half of Yancey Co., in western North Carolina. The park was established in 1915 and comprises an area of 1,200 acres. Mt. MITCHELL, 6,711 ft. in elevation, is the highest mountain in the eastern United States. The region is a game preserve and is heavily forested with a sub-alpine type of fir and spruce. The park is northeast of Asheville and is reached from a United States Interstate Highway and the Southern Railroad.

**MOUNT OF OLIVES.** See OLIVES, MOUNT OF.

**MOUNT OLIVER**, a residential suburb of Pittsburgh, a borough of Allegheny Co., situated in southeastern Pennsylvania; it is served by the Pittsburgh Electric Railway. Pop. 1920, 5,575; 1930, 7,071.

**MOUNT OLYMPUS NATIONAL MONUMENT**, a vast tract of 298,730 acres in the Olympia Mountains south of the Strait of Juan de Fuca in northwestern Washington. It was established Mar. 2, 1909 and is the largest of the national parks and monuments in the United States excluding Alaska. Mt. Olympus, the principal peak, has an elevation of 8,150 ft. above sea level. The region is a real wilderness area having neither settlements, supply points nor human habitation of any kind. There are numerous glaciers and other features of outstanding scientific interest. The rare Roosevelt elk roams the region in bands numbering several thousand head. Their summer feeding grounds are within the monument. This particular species of the elk is native to this area and is not found elsewhere. Mount Olympus National Monument is under the administration of the Department of Agriculture. It is accessible from Port Angeles which is reached by ferry from Seattle or by a U.S. Interstate Highway.

**MOUNT PLEASANT**, a city in southeastern Iowa, the county seat of Henry Co., 28 mi. northwest of Burlington and served by bus lines and the Chicago, Burlington and Quincy Railroad. It is a shipping market for grain, poultry and livestock and is the seat of the Iowa Wesleyan College. The P. E. O.

Sisterhood was founded in Mt. Pleasant. The site was settled in 1834 and incorporated in 1851. A state park and a celebrated bed of geodes are nearby. Pop. 1920, 3,987; 1930, 3,743.

**MOUNT PLEASANT**, a city in southern central Michigan, the county seat of Isabella Co., situated on the Chippewa River, 70 mi. north of Lansing. It is a shipping point served by the Ann Arbor and the Pere Marquette railroads, which handle the crops of the region, chiefly beans and sugar beets. Near by are oil and gas fields. The city industries include an oil refinery and manufactures of veneer, lumber products, beet sugar, and bathroom fixtures. It is the seat of the Central State Teachers College. Mount Pleasant was founded in 1875 and incorporated in 1889. Pop. 1920, 4,819; 1930, 5,211.

**MOUNT PLEASANT**, a borough in Westmoreland Co. in southwestern Pennsylvania. It is situated 32 mi. southeast of Pittsburgh and served by two railroads. The region has coal mines and is good farming country. The chief local industries are glass manufacture and coke making. In addition it has an auto truck body factory, commercial lime plant, two foundries, and flour and lumber mills. Mount Pleasant was founded in 1782 and incorporated in 1828. Pop. 1920, 5,862; 1930, 5,869.

**MOUNT RAINIER NATIONAL PARK**, situated in west central Washington in the heart of the Cascade Range, was established by Congress, Mar. 2, 1899. The boundaries were extended May 28, 1926, giving the park its present area of 377.78 sq. mi. of which the mountain itself covers about 100 sq. mi.

**Topography.** Mt. RAINIER is one of the high peaks of the United States. It is 14,408 ft. above sea level and rises approximately 11,000 ft. immediately above its base. Its snow-capped summit is visible for over 150 mi. when approached overland and is a landmark far out at sea. From Tacoma or Seattle, the intervening mountains appear as tributary ridges and it seems to rise to its full height above sea level as a single peak. Mt. Rainier once was a great volcano with an almost perfect cone rising approximately 2,000 ft. higher than its present summit. The terrific explosion which blew off the top of the mountain is recounted in Indian legends. A slight eruption occurred as late as 1879. Mt. Rainier is now classed as a dormant volcano.

The lower slopes are covered with a dense forest of fir, cedar, hemlock, maple, cottonwood and spruce. The forest continues to about 4,500 ft. where the grassy meadows and famous wild flower beds begin; these extend far up to the borders of the glaciers. A zone about 2 mi. wide and 50 mi. in circumference between the forests and the glaciers contains one of the richest and most colorful sub-alpine gardens on the continent.

**Glaciers.** On a topographical map, Mt. Rainier appears like an octopus stretching out many arms in all directions. Its 28 glaciers, carving their way through 14 valleys and covering 48 sq. mi. of territory, form one of the largest glacial systems issuing from a

single mountain. Six glaciers, the Nisqually, Ingraham, Emmons, Winthrop, Tahoma, and the Kautz, seem to originate at the summit. Others including the Cowlitz, Paradise, Fryingpan, Carbon, Russell, North and South Mowich, Puyallup and the Pyramid glaciers begin farther down the mountain. The glaciers vary from 500 ft. to 1 mi. in width, and from 50 ft. to many hundreds or perhaps more than 1,000 ft. in depth. Minute insects hop about on the ice like tiny fleas and millions of slender dark brown worms thrive in the surface ice. In certain places, microscopic rose-colored plants grow in such profusion as to tint the ice and cause the phenomenon known as "red snow." The Nisqually Glacier is accessible by automobile road and is the one most usually visited by sight-seers. This glacier is 5 mi. long and at Paradise Valley, a popular winter and summer resort, it is half a mile wide. In summer the center of this glacier moves downward about 16 in. a day. The outer edges move more slowly, being retarded by friction of the sides which are lined with lateral moraines of varying size. The Nisqually River flows from beneath the glacier's terminal moraine.

**Travel Routes and Facilities.** There are three automobile roads within the park beginning respectively at the Nisqually entrance at the southwest, the Carbon River entrance at the northwest, and the White River entrance at the northeast. These roads reach many important points of great scenic interest. In addition 241 mi. of horse and foot trails reach every glacier, completely circle the mountain and extend to the summit. Public camping grounds and shelter cabins are maintained by the National Park Service for the convenience of visitors.

All entrances are accessible on paved automobile highways from Tacoma, Portland and Seattle. Daily stage service from Tacoma and Seattle and from Ashford, Wash., the nearest railroad point on the Chicago, Milwaukee, St. Paul and Pacific system, is maintained throughout the year. The park is always open. The summer season begins on the last Saturday in June and extends until Labor Day.

**Educational Features.** Field trips escorted by staff naturalists are an important part of the educational program in Mt. Rainier Park. The staff naturalists also give lectures at stated times on such subjects as geology, zoology, botany and glacial phenomena. The museum at Longmire Springs contains many exhibits including several donated by the University of Washington. More than 600 metal labels on the self-guiding nature trails aid the visitors in understanding geologic and biologic features. Among the points of particular interest thus marked are former locations of the slowly retreating glacier.

**MOUNT REVELSTOKE**, a Canadian national park 100 sq. mi. in area near the town of Revelstoke on the Columbia River in British Columbia. It was established Apr. 28, 1914, forming the most western link in Canada's national park system and dedicated in 1919 by the Prince of Wales. A 19 mi. drive to the summit of the mountain affords magnificent pano-



ramic views of the Columbia and Illecillewaet valleys to the south and west, the Clach-na-cuddin ice-field and lakes Eva and Millar. The mountain is 7,000 ft. high. Its summit is an expansive plateau of over 2,000 acres with rolling uplands, scattered groves of spruce, fir and hemlock, and several small lakes. The park is a game preserve and a popular resort for winter sports. It is reached by improved motor highways and the Canadian Pacific railroad.

**MOUNT ROBSON PARK**, a park in British Columbia, Canada, adjoining JASPER. The park has an area of 640 sq. mi. and contains several high peaks including Mt. Robson, elevation 13,068 ft., the highest mountain in the Canadian Rockies. Glaciers, deep canyons, colored lakes and waterfalls are accessible by trail. The lower slopes of the mountains are well forested and contain deer, bear, elk, caribou and other wild life, all protected by game laws. Rivers and streams are well stocked with fish. The park is reached by the Canadian National railway and improved motor roads.

**MOUNT RUSHMORE.** See BLACK HILLS.

**MOUNT UNION COLLEGE**, Alliance, O., founded in 1846 under the auspices of the Methodist Episcopal Church, was one of the early coeducational schools in the United States. Organized as a Select School, it was named Mt. Union College in 1858. In 1911, Scio College, of Scio, O., was united with it. The productive funds in 1931 totaled \$1,522,790. There were 36,000 volumes in the library. In 1931-32, there were 635 students and a faculty of 44, headed by Pres. W. H. McMaster.

**MOUNT VERNON**, a city and the seat of Jefferson Co., in southern Illinois, about 75 mi. southeast of East St. Louis. The city has adequate railroad facilities for shipping the produce of the surrounding fruit-growing region, specializing in peaches. There are diversified local industries, including flour mills, hosiery and shoe factories and freight-car works. The retail trade in 1929 amounted to \$6,772,241. A cyclone in 1888 inflicted considerable damage. Settled in 1819, Mount Vernon was chartered in 1872. Pop. 1920, 9,815; 1930, 12,375.

**MOUNT VERNON**, a city in southwestern Indiana, the county seat of Posey Co., situated on a bluff above the Ohio River, near the mouth of the Wabash River, about 20 mi. southwest of Evansville. It is served by steamboats and two railroads. Mount Vernon is located in a rich agricultural region, and has trade in corn, wheat, hay and agricultural machinery. Flour, cereals, agricultural machinery, metal castings, lumber and wood products are the chief local manufactures. Bituminous coal is mined in the vicinity. Pop. 1920, 5,284; 1930, 5,035.

**MOUNT VERNON**, a city of Westchester Co., southeastern New York, situated between the Bronx and the Hutchinson rivers, just north of New York City, of which it is chiefly a restricted residential suburb. It is served by three railroads. The manufactures are varied, their value in 1929 amounting to \$12,171,887. In 1929 the retail business reached a

total of \$38,211,975. This site was settled by Connecticut colonists in 1664 under the name of Ten Farms, or Eastchester. A century later was begun St. Paul's Episcopal Church, which was used by the British as a military hospital during the Revolutionary War, and which is still standing. The village of Mt. Vernon was settled by an association of working people in 1851 and was incorporated as a village 2 years later; in 1892 it was chartered as a city. Pop. 1920, 42,726; 1930, 61,499.

**MOUNT VERNON**, a city of central Ohio on the Kokosing River about 45 mi. northeast of Columbus, the county seat of Knox Co. It is served by the Baltimore and Ohio and the Pennsylvania railroads. The state sanitarium for tubercular patients is here. Mount Vernon is in the midst of a rich agricultural region, and it is also a large manufacturing center, making steam, gas and Diesel engines, structural iron, lumber and glass. Settled in 1804, Mount Vernon was chartered as a city in 1845. Pop. 1920, 9,237; 1930, 9,370.

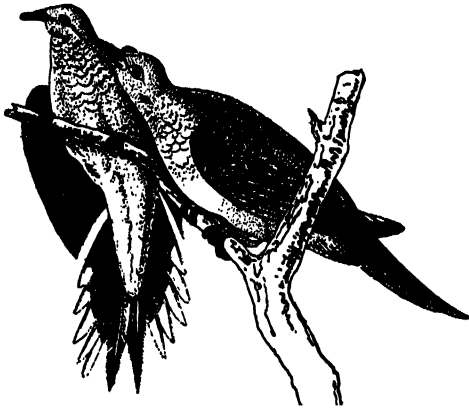
**MOUNT VERNON**, the mansion and burial place of GEORGE WASHINGTON, in Fairfax Co., Virginia, 16 mi. south of Washington, D.C., situated on a grassy bluff overlooking the Potomac River. Set within shield-shaped grounds amidst beautiful trees, roads and paths, this stately Colonial home consists of a central structure and various outlying buildings (as the kitchen, stables and slaves' quarters), connected by a curved arcade. The impressive central portion, 2½ stories high, 96 ft. long and 30 ft. deep, is made of wood, finished and painted to resemble stonework. Quiet, dignified, substantial, surmounted by a cupola and having at its front a splendid portico of eight square pillars, the house contains some 19 rooms, many handsomely paneled, the most interesting of which are the library, the banquet-hall, and the bed-room where Washington died, all furnished with pieces that are either originals or that have been restored or replaced. The simple brick tomb containing the remains of Washington, his wife and various members of the family, stands in a shady ravine a short distance southwest of the house.

Mount Vernon, acquired by Washington in 1761 through the widow of his elder half-brother Lawrence, was enlarged and improved by the first President, and passed after his death from one member of the family to another until 1858. Then, with 202 acres of the estate, it was sold by John A. Washington for \$200,000 to the Ladies' Mount Vernon Association, by which it has since been restored and controlled.

**MOUNT VERNON**, a city in northwestern Washington, the county seat of Skagit Co. It is situated on the Skagit River, 66 mi. north of Seattle and is served by buses, river steamships and the Great Northern Railroad. Mount Vernon is a trade center for a diversified farming region and has canning and dairy products plants. It is a center of cabbage, beet and turnip seed cultivation. A junior college is here. The city was founded in 1877 and incorporated in 1890. Pop. 1920, 3,341; 1930, 3,690.

**MOURNING CLOAK**, a species of butterfly (*Aglais antiopa*) of the group known as the anglewings. Wings are purplish-brown above, the outer margin broadly yellow. A row of blue spots is just within this yellow border. Lower surfaces of the wings are blackfish. Larvæ are velvety black, spiny, and have large red spots along the middle of the back. They feed on poplars, willows and elms. Adults hibernate.

**MOURNING DOVE** (*Zenaidura macroura*), a species of ground pigeon, so named because of the peculiar, sad, sweet call of the male. In coloration, the male, which is about a foot long, is light grayish-brown above, with a bluish-slate colored crown and wings and vinaceous and buffy underparts; the female is similar but smaller and browner. This common bird is found throughout temperate North America southward to Panama and the West Indies, mi-



MOURNING DOVE—FEMALE AND MALE

grating only in the more northern part of its range. It is tame and gentle, often coming about dwellings to nest or feed with the domestic poultry. At breeding time it resorts to open woods or tree-bordered fields, but later assembles in flocks in pastures and grain fields. The mourning dove feeds chiefly on seeds, berries, and other vegetable substances; it nests usually in bushes or low trees, building a slight platform of twigs, but sometimes deposits its eggs on the ground. It lays usually 2 white eggs, in the incubation of which both parents assist, and often rears 2 or 3 broods in a season.

**MOUSE**, a small rodent of the family *Muride*, typically of the genus *Mus*. Mice occur in every part of the world and their forms and adaptations in food and habits to local conditions are exceedingly numerous. A familiar yet typical example is the little gray house mouse (*Mus musculus*), whose original home apparently was in Asia, but which has spread over practically all the world, little changed through thousands of years, probably because it has clung to domestic habits. Nevertheless, in countries where grain is stacked in ricks or similar storage, house mice

rival wild ones in causing damage and waste by nesting among and eating the valuable seeds. In general mice are the mainstay for food of a great variety of animals, birds and reptiles, but their fecundity enables them to survive this constant massacre. From time to time, certain mice multiply in such numbers as suddenly to become a moving plague that devastates a whole neighborhood before disease and animal enemies overcome them. The white mice prized as pets by children are a fixed albino variety of the house mouse. E. I.



HOUSE MOUSE

**MOUSE-BIRD**, the name given to a family (*Coliidae*) of small African birds allied to the swifts and trogons. There are about 14 species, all about a foot in length, most of which length is tail, crested heads and stout finchlike bills. Their short dense plumage is largely brownish or gray, sometimes marked with blue, white or chestnut. Mouse-birds move usually in small parties and frequent forested districts. They are very active, creeping about the branches, like parrots, often with the head downward. They feed almost entirely on fruit and nest in dense brush laying 3 or 4 usually white eggs. Their notes are harsh and unmusical. Mouse-birds are unique in that all four toes are directed forward and, when roosting, they rest suspended beneath the branch.

**MOUSSORGSKY, MODESTE PETROVICH** (1835-81), Russian music composer, was born at Karev, March 28, 1835. Trained for a military career, he resigned his commission in early life to devote himself to music upon the advice of BALAKIREV. Unable to make a living with his music he accepted a government position in 1865. Despite lack of leisure and a constitution weakened by drugs, he produced several works which have found a secure place in Russian music. Foremost among these is the opera *Boris Godounov*. He started several other operas but only one, *Khovantchina*, was carried as far as a completed vocal score, which RIMSKY-KORSAKOV edited and orchestrated. His other works include a symphonic poem, *A Night on Bald Mountain*, and a collection of pianoforte pieces, *Pictures from the Exhibition*. His technical skill was defective, but a native vigor of manner compensated for many faults of craftsmanship, while his passionate espousal of a national music for Russia helped stem the tide of Italian influence in that country. This espousal had an important effect on the music of later Russian composers who, following Moussorgsky's lead evolved a distinctly Russian school of modern music. The composer died at St. Petersburg, Mar. 28, 1881.

**MOUSTERIAN CULTURE**, the stage of culture found in the Middle PALÆOLITHIC PERIOD of the Old Stone Age, which was later than the Acheulian of the Lower Palæolithic, and earlier than the Aurignacian of the Upper Palæolithic. It is placed toward the close of the third Interglacial and the beginning of the fourth glacial interval of the Pleistocene period.

This stage of culture is represented by discoveries in the cave of Le Moustier, near the village of Les Eyzies, on the Vézère River, in south central France.

Mousterian flint implements were developed from CHELLEAN and ACHEULIAN. The chipping of the flint was sometimes done on part of a large nodule, this part being then knocked off by a skillful blow, with the result that the detached part was chipped on one side only; but the usual method was to retouch the edge of the flake after it had been detached from the nucleus. There are several types of scrapers, used to scrape hides, or to smooth the surface of sticks, perhaps wooden spears. Man of the Mousterian stage is represented by many skeletons, found at Gibraltar, 1848; at Neandertal, 1856, which gives a name to this type; at Spy in Belgium, 1886; at Krapina near Zagreb (Agram) in Yugoslavia and elsewhere. Mousterian man was powerfully built, with a long low skull and a heavy brow ridge. See ARCHAEOLOGY.

**MOUTH, DISEASES OF.** Diseases of the mouth include decay of the teeth (called dental caries), pyorrhea and abscesses; or diseases of the gums, tongue or lips.

Pyorrhea generally begins about middle adult life, and is believed to be due to the retention of decomposing food particles in places from which it is difficult to dislodge them. The gums become soft, tend to bleed, begin to recede and pockets form between the teeth from which pus is discharged. In a less common form of pyorrhea, the gums recede in clean mouths without the formation of much pus. In debilitating diseases there is a greater tendency to pyorrhea than in good health. (See also PYORRHEA.)

Although *dental caries* is a disease of all ages, it is particularly prevalent in children and young adults, and is limited largely to the human race. However, clean, well cared for, properly used teeth in a healthy body, do not, as a rule, decay. Accordingly, it is necessary not only to clean the teeth regularly, but also to choose a diet that includes an ample supply of minerals and vitamins and requires thorough chewing, as one containing liberal amounts of milk and milk products, fresh fruits and vegetables. Carious teeth require prompt dental care.

Germs from the mouth find their way into the tooth pulp exposed by dental decay and thence to the space in the bone around the tip of the root. This is the beginning of what is popularly called the *ulcerated* or *abscessed tooth*. There are three general varieties of this condition. The first is quite acute, with sudden onset, much pain, swelling and a high fever; it may spread rapidly, ending in blood poisoning (see SEPSIS), or it may be confined locally with the formation of pus requiring prompt surgical drainage.

A second form is less violent, but extends through the adjacent bone, causing death of the bone, and finally discharging pus through a passage that opens into the skin of the cheek or neck, or into the mouth. It is more common in children whose baby teeth and six-year permanent molars are permitted to decay

without dental care. Both of these forms are true abscesses.

A third form develops slowly with few or no symptoms and is discovered, as a rule, by taking X-ray pictures of the teeth and jaw bones. It consists of a pulpy mass of flesh with numerous vessels, usually nests of bacteria, and is surrounded by a thin fibrous capsule. Although it does not contain pus, it is usually described as a *pus sac*, or a *blind abscess*. The pressure of this pus sac causes some destruction of the adjoining bone, and it is this that produces the shadow seen in the X-ray film. Both these blind abscesses and the pus pockets of pyorrhea are thought to be the source of some of the chronic diseases found elsewhere in the body. The blind abscess is more common on the roots of teeth from which the pulp has been removed and replaced by some substitute, as gutta percha. It is chiefly for this reason that these pulpless, devitalized teeth are blamed for causing chronic illness.

These blind abscesses may change their character, the fibrous wall becoming covered with a membrane consisting of epithelial cells, like those lining the inside of the mouth and covering the gums. The contents of the sac are converted into a watery fluid and this cavity formed in the bone is called a cyst. Other forms of cysts may develop from remnants of tooth germs or skin structures. They may occur in the jaw bones, in the lips, the cheeks or the floor of the mouth.

*Superficial ulcerations* of the mouth are common. Some of these are of doubtful origin, as the so-called *canker sore* which is related to digestive and nervous disturbances. Others are associated with the irritation due to pressure or actual injury from badly fitted artificial teeth or the jagged crowns of decayed teeth. In children, an infection with a fungus is characterized by the formation of tiny ulcers, covered with a white coating. This is called *thrush*.

In both children and adults an acute ulceration of the crests of the gums sometimes occurs. This is quite painful, is mildly contagious and is caused by two or more varieties of germs that thrive best in recesses in which there is little or no oxygen, and that retain decomposing food. It is *Vincent's disease* and since the World War is often called trench mouth.

Most of the acute diseases that have skin eruptions have similar changes in the mouth, such as, the bluish white spots (Koplik's spots) occurring in measles before the body rash, the vesicles and pustules that are found in chicken-pox and smallpox, and the strawberry tongue of scarlet fever. In the second stage of syphilis, slightly elevated, quite contagious spots called mucous patches are found in the mouth. Tuberculosis sometimes involves the mouth. Many of the commoner diseases of the skin have corresponding conditions in the mouth.

*Tumors* of all kinds occur in the mouth as elsewhere in the body. Many of these are quite innocent and harmless, particularly those that develop on the

gums, or in the roof of the mouth. On the other hand, there are other varieties, like cancer, that are likely to be very serious, such as cancer of the tongue and lips, which seems to be much more common in men than in women.

*Deformities of the mouth* are not rare. These frequently concern the number of the teeth. Missing teeth are very rare in the milk teeth, but occur moderately often in the permanent set. Third molars, upper lateral incisors and lower pre-molars are those most frequently absent, occurring often through several generations. Complete absence of the permanent set of teeth has been reported. Supernumerary teeth occur oftener than missing teeth. Many of these are small and misplaced, may erupt at any time, or may be fused with other teeth. Teeth frequently fail to erupt and are found deeply embedded in the jaw bones (impacted teeth). Teeth frequently erupt in unnatural positions. They may be spaced irregularly or crowded together. The forms of the lower and upper arches may be irregular and unsymmetrical due to bad habits, such as persistent thumb-sucking. Severe illnesses during the period of tooth development (that is, from before birth to early adult life), may cause faulty structure of the crowns and roots. The major defects of development of the mouth structures are CLEFT PALATE AND HAIRLIP, which may be found in the same individual.

See also DENTISTRY; TEETH; MOUTH AND SALIVARY GLANDS. E. H. H.

**MOUTH AND SALIVARY GLANDS.** The mouth cavity is at the upper end of the alimentary tract. It extends from the lips to the fauces or throat and contains the two rows of teeth, behind which its roof is formed by the hard and soft palate, its sides by the cheeks, and its floor by the tongue.

The functions of the mouth in the human being are to receive food, tear and grind it up, moisten it and swallow it. Food is apprehended either by sucking or by the teeth. It is ground by the molar or grinding teeth, it is swallowed by muscular action which begins as an elevation of the floor of the mouth including the tongue: it is moistened by the innumerable salivary glands.

In sucking, the throat is closed—air tight: the valve-like soft palate is pulled down to meet the base of the tongue; the two sides of the throat are pulled close against them by the same action. Then the anterior part of the tongue and mouth floor are pulled down. The lips seize whatever is to be sucked. In biting, the great jaw muscles bring the lower jaw against the upper; in chewing these same muscles coöperate with another muscle which moves the lower jaw from side to side and so grinds the food held in place by cheeks and tongue.

Meanwhile the salivary glands are stimulated. They are everywhere in the mouth—roof, sides, and floor: four bigger ones are named the parotid salivary gland (ferment forming), sub-maxillary, sublingual and anterior lingual (ferment and mucus forming). The ferment glands need only tiny ducts, for their

product is a thin solution: the mucous glands have big ducts, for their product is viscid. On an ordinary diet a man produces  $1\frac{1}{2}$  quarts of saliva daily—more with dry food. The general mucous lining of the mouth is necessarily tough and strong because of the rough character of the food. It consists of 12 to 20 layers of cells and from it the large glands grow out as sprouts connected by a stalk (duct). The innumerable small glands are pits—often branched at their deep ends.

The tongue surface is modified for holding food (filiform papillae) and for tasting food (taste-buds). At the bottom of the crypts around these are ferment glands. Tasty particles of food stimulate them and the outgushing of their secretion washes out the crypts, rinses the taste-buds and makes them ready for a new stimulation.

B. C. H. H.

**MOUTH WASHES.** See DENTAL PREPARATIONS.

**MOVING CLUSTER**, a group of stars widely separated in the sky, as seen from the earth, but physically connected, and moving through space together. A good example of a moving cluster is the Ursa Major cluster, comprising five stars of the Big Dipper, Sirius, Alpha Coronae, Beta Aurigae and many others.

**MOWAT, SIR OLIVER** (1820-1903), Canadian lawyer and Liberal statesman, was born in Kingston, Upper Canada. After participating in political life from 1857 to 1864, during which time he was a delegate at the Quebec Conference, Mowat became vice-chancellor of Upper Canada, but left the bench to succeed EDWARD BLAKE as prime minister of Ontario in 1872. During his term, 1872-96, the longest in British parliamentary annals, Mowat extended the franchise and vigorously upheld provincial rights. For a short time, from 1896 to 1897, he was a member of the Canadian Senate and of the Laurier ministry of the day, but retired to become lieutenant governor of Ontario.

T. P. P.

**MOWERS**, implements which cut grasses and other forage crops used for hay. The cutting mechanism consists of a reciprocating knife made up of a number of sections. Each section, with a stationary blade underneath, constitutes a pair of shears. The cutter bar varies in length from five to seven ft. The mower is usually drawn by two horses, and power to operate the knife is obtained through the wheels. See also LAWN MOWERS.

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**MOZAMBIQUE**, or Portuguese East Africa, a colony of Portugal on the east of Africa, lying between  $11^{\circ}$  and  $27^{\circ}$  S. lat. and extending from the River Rovuma to beyond Delagoa Bay, a distance of 1,300 mi. Area 287,756 sq. mi.

Mozambique is divided by the ZAMBESI; another large river, the LIMPOPO, is in the south. The coastal area is low and swampy, but the interior rises into grass-covered highlands. The temperatures are tropical, though modified by elevation. Development is in the hands of large companies, and is conducted on

plantation lines; little encouragement is given the native to become a producer on his own account.

Heavy crops of maize are raised. Sisal, sugar and copra are important plantation products, and cotton, tobacco, kapok and coffee are also cultivated. Big game, including the elephant, is plentiful. Cattle are kept on the uplands owing to the prevalence of the tsetse fly in the lowlands. Ancient gold workings, possibly prehistoric, are numerous. Gold and coal are mined, and iron, copper and petroleum are known to exist.

The seat of administration is LOURENÇO MARQUES. Beira has a large shipping and railroad trade. The territory is governed by a Portuguese high commissioner, except for two districts which are controlled by the Mozambique Company and the Nyasa Company, in both of which there are British interests. Pop. 1930, 3,514,602, including 17,842 Europeans, mostly living in Lourenço Marques and Beira, and a sprinkling of Arabs and Indians.

**MOZARABS.** "those who have become Arabs," a term of ridicule applied to Christians in Spain. In most towns they formed but a small community, carrying on their rites by Moslem sufferance, when not bitterly persecuted by the rulers. Under the Almoravides (see MARABOUTS) they were finally expelled from southern Spain.

**MOZART, WOLFGANG AMADEUS** (1756-1791), Austrian music composer, was born at Salzburg, Jan. 27, 1756. The son of Johann Georg Leopold Mozart (1719-87) and Anna Maria Pertlin, he was the only one of seven children, save his sister Nannerl, who survived infancy. His father, an exceedingly able composer, who himself composed 12 oratorios and 18 symphonies, took charge of his son's musical instruction, which advanced so rapidly that he began composing at the age of five and played for the Emperor Francis I at the age of six. The next year he gave recitals in Paris, and the year afterward in London. At the age of 11 he composed his first oratorio and his first opera, *La finta Semplice*. While in Rome with his father he executed his historic feat of writing out Allegri's *Miserere* after twice hearing it. Although only 14, he was given the order of the Golden Spur by the Pope and elected a member of the Bologna Philharmonic Academy, easily passing the examinations. Triumphs too numerous to catalogue followed. However, despite his appointment as capellmeister to the archbishop of Salzburg and the tokens he received from wealthy patrons, his financial affairs were perpetually in disorder, and when, in 1782, he married Constanze Weber, who bore him four sons and two daughters, the family exchequer collapsed. Some of his most famous work, *Le nozze di Figaro*, *Don Giovanni*, *Così fan tutte*, *Die Zauberflöte*, and the famous *Requiem* were composed under the stress of poverty.

Among German composers (see MUSIC) of the classical period, Mozart had no rivals in musical polish. That he lacked the majesty of BACH and the heroic fever of BEETHOVEN is unquestionable.

On the other hand, he stands securely among the elect, the supreme masters of German music, by reason of his passionate regard for formal purity. Among the more important of his 528 compositions, besides those already mentioned, should be cited 15 masses, 25 pianoforte concertos, 49 symphonies, 6 violin concertos, 42 violin sonatas, 26 string quartets, and the operas *Idomeneo* and *The Escape from the Seraglio*. Mozart died at Vienna, Dec. 5, 1791.

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**"MRS. PARTINGTON."** See SHILLABER, BENJAMIN.

**MUD-DAUBER WASP**, certain of the thread-waisted wasps (subfamily *Sphecinae*) which build mud nests. Females are often seen gathering mud from damp places. Nests are often attached to ceilings, rafters or walls of buildings. Each consists of several tubes placed side by side. As each tube is constructed, the female wasp provisions it with small spiders. These are stung so as to paralyze but not to kill them. An egg is next laid on the pile of spiders, and the tube sealed. The young larva feeds upon the spiders until mature. Then it spins a thin cocoon and pupates within it. A hole in the tube usually indicates that the adult has emerged. Some species of the subfamily *Trypoxyloninae* are likewise mud-daubers.

**MUDEJAR STYLE**, in architecture, the style produced in Spain during the late Gothic and early Renaissance periods, by Moorish artisans working in their own traditional manner for Christian employers. Mudéjar work is characterized by the use of patterned brickwork, often forming arcades in exterior design; and on the inside by the great use of tile wainscots with Moorish geometric interlaces, occasional use of the cusped horseshoe arch and Moorish foliage patterns, often in plaster, and rich and intricate carpentry ceilings, or artesonados. The Mudéjar style exerted a profound influence on all the late Gothic architecture of Spain, and much Spanish Renaissance work as well. Characteristic examples of the style are the "House of Pilate" in Seville, almost purely Moorish; the tower of S. Andres in Calatayud, the Puerta del Sol in Toledo, and part of the decoration of Burgos Castle.

See Georgiana Goddard King, *Mudéjar*, 1927.

**MUD HEN**, a name sometimes given to species of Coot, small, somewhat ducklike birds frequenting reedy marshes; also sometimes applied to the BITTERN.

**MUD MINNOW**, the common name for a small family of minnow-like fishes allied to the pikes, from which they differ in having a short snout, a small mouth and weak teeth. They are sluggish, living, often in large numbers, in the mud at the bottom of streams and ponds and feeding upon small aquatic animals. Extremely tenacious of life, they often retain their vitality in dried up sloughs and bogholes and are sometimes plowed up alive. The common mud minnow or dogfish (*Umbra limi*), about 4 in. long

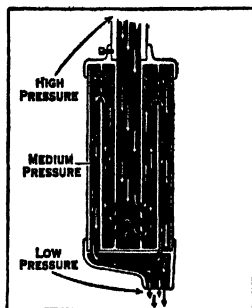
and greenish olive marked with black, is found in the Great Lakes region and upper Mississippi Valley. The striped mud minnow (*U. pygmaea*) is found near the coast from Long Island to North Carolina. See also PIKE.

**MUD-PUPPY**, the popular name for a species (*Necturus maculatus*) of tailed amphibian belonging to the same family (*Proteidae*) as the olm. It is found in the lakes and rivers of the eastern United States and Canada, where it lives on muddy bottoms, and swims about after other aquatic animals. The mud-puppy is about a foot long, and resembles its cousins, the newts and hellbenders, except for its red, branched external gills.

**MUEZZIN**, one who gives the *azan* (*adhan*), or Moslem call to prayer, whether in connection with Friday worship or the five daily prayers. In small mosques the IMAM himself may give the *adhan* before taking his place as leader of prayer. The larger mosques may have special muezzins for the call. These callers may cry aloud from the balcony of the minaret, or from the floor of the mosque. The first muezzin in Islam was the strong voiced ex-slave, Bilal, of the community of Medina. Mohammed determined to have the faithful summoned to prayer not by Jewish trumpets, Christian bells, or pagan conch-shells, but by the human voice. The *adhan* of the orthodox community, translated, runs as follows, "Allah is most great (often four times declared). I testify that there is no God but Allah. I testify that Mohammed is Allah's apostle. Come to prayer. Come to salvation. Allah is most great. There is no God but Allah." The Shiite *adhan* is the same, except that the phrase, "Come to the best work" is added after "Come to salvation." Moslems, hearing the *adhan*, repeat to themselves the muezzin's words, except where they may say, instead, "There is no strength nor power but in Allah." There is no common melody for the *adhan*; it varies from place to place, if only the Arabic words themselves are properly pronounced.

J. C. A.

**MUFFLER**, a device for dampening the audible vibrations set up in the air by the exhaust from an



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DIAGRAM OF GAS FLOW DURING EXPANSION IN MUFFLER

INTERNAL COMBUSTION ENGINE. The combustion gases, as they pass out the exhaust pipe at high velocity, set up severe vibrations in the air, well within the audible, or hearing range. To abate these sharp sounds, various arrangements of baffles have been designed, most of which embody some form of expansion chamber.

**MUFTI**, a teacher who interprets the Canon Law of Islam, including the KORAN and Tradition. The mufti writes his opinion (*fatwa*), and the CADI, or judge is bound by it in his

decision on religious matters. The muftis at times have exerted a powerful influence. The most important one is known as the Shaikhu'l-Islam, the mufti of Constantinople. This office was an appointment of the Sultan, during Osmanli times, and is continued under the Turkish Republic.

**MUGGER**, the common fresh-water crocodile of India and Ceylon (*Crocodylus palustris*). Attaining a length of but 12 to 14 ft., it is much smaller than *C. porosus*, the great eastern salt-water species. The mugger lacks the prominent ridges extending from the eye along the snout of *C. siamensis* and *C. porosus* and may thus be distinguished from them. Inhabiting rivers, lakes, tanks and swamps, it feeds chiefly on fish and birds. Drought often forces it to make long overland journeys or it may bury itself in the mud during the dry season. The eggs, 40 or more in number, are buried in sandbanks and incubated for a period of six or seven weeks; the young when hatched are about 10 in. long.

**MUGWORT** (*Artemisia vulgaris*), a perennial branching herb of the composite family, widely grown in numerous varieties for its ornamental foliage. It is a native of Europe and Asia extensively naturalized in eastern North America. The erect purplish stem bears fragrant, deeply cut leaves, dark green above and white woolly below, and numerous small yellowish flowerheads in narrow branching clusters.

**MUGWUMPS**, Republicans who in 1884 refused to vote for their party's nominee for the presidency, JAMES G. BLAINE. They objected to Blaine as a machine politician of dubious ethical record, and an opponent of civil service reform. The name, an Algonquin word for great man, was applied to the bolting Republicans by pro-Blaine newspapers, deriding the self-importance of the Independents. The term has since been applied to other groups who have rejected party nominees on grounds of personal dislike, or in behalf of particular reforms.

**MUHLENBERG, FREDERICK AUGUSTUS CONRAD** (1750-1801), American clergyman and politician, was born at Trappe, Pa., Jan. 1, 1750. He was educated at Halle, Germany, and was ordained in the Lutheran church. After serving as pastor of a Lutheran church in New York, 1773-76, the growing tension in colonial affairs turned his attention to politics and he returned to his native Pennsylvania and in 1779 was elected to the Continental Congress. He was twice speaker of the House of Representatives. In 1795 he cast the deciding vote which saved the Jay Treaty from defeat. He also served in the Pennsylvania legislature, of which he was speaker two terms. Muhlenberg died at Lancaster, Pa., June 4, 1801.

**MUHLENBERG, HEINRICH MELCHIOR** (1711-87), patriarch of the Lutheran Church in America, was born at Eirbeck, Hanover, Prussia, Sept. 6, 1711. After graduation at the University of Göttingen in 1738, he accepted a call from the Lutheran Congregations of Pennsylvania, and went to Philadelphia in 1742. Except for two summers (1751-52) in

charge of the church in New York City, Muhlenberg traveled the country from New Jersey to Georgia, organizing congregations of Lutherans. As early as 1749, he purchased land on which to build a seminary for training pastors. The first Synod was established by him and the first Lutheran liturgy in America (1748) was written by him. He died at Trappe, Pa., Oct. 7, 1787.

**MUHLENBERG, JOHN PETER GABRIEL** (1746-1807), American minister and soldier was born at Trappe, Pa., on Oct. 1, 1746. He was educated for the ministry, and for a brief period was pastor of the Lutheran church at New Germantown, N.J. He is remembered in Revolutionary history for the line of his last sermon: "There is a time for all things—a time to preach and a time to fight—and now is the time to fight." At Washington's request he became a colonel in the Continental army. After seeing action at Charleston in 1776, he was appointed brigadier-general in command of the Virginia line. He was present at the battles of Brandywine, Germantown, Monmouth, and at the capture of Stony Point. After the war, Muhlenberg returned to Pennsylvania, and, elected on a Jeffersonian ticket, served in the House of Representatives during 1789-91, 1793-95, and 1799-1801. Muhlenberg died at Philadelphia, Pa., on Oct. 1, 1807.

**MUHLENBERG COLLEGE**, at Allentown, Pa., a coeducational institution originally called Allentown Seminary, was chartered in 1864 as Allentown Collegiate Institute and Military Academy. In 1867 it was renamed Muhlenberg College. It is under the control of the Evangelical Lutheran Ministerium. The grounds and buildings are valued at \$1,599,937, and the library contains 41,600 volumes. In 1930 the student enrollment was 440, and the faculty of 32 was headed by Pres. John A. W. Hass.

**MUHLHAUSEN**, a Prussian town on the Unstrut River about 68 mi. southwest of Halle. It was first mentioned in 775 and was a free imperial city from 1251 to 1802. Its notable buildings include St. Blasius' Church and the Church of Our Lady, Gothic edifices of the 12th and 14th centuries, and the rathaus, rebuilt at the end of the 16th century. The city manufactures principally textiles, and trades in lumber and leather. Pop. 1925, 36,755.

**MUIR, JOHN** (1838-1914), American naturalist and author, was born in Dunbar, Scotland, Apr. 21, 1838. He emigrated to the United States and was educated at the University of Wisconsin. He later explored the western coast of North America and Alaska and discovered the Muir Glacier in Alaska. In 1878 he joined the U.S.S. Corwin expedition in a search for the De Long Expedition in the Arctic regions. In 1899 he again explored Alaska. From 1903 to 1912 he traveled further afield, visiting Russia, Siberia, India, Australia, New Zealand, South America and Africa. Muir fought vigorously for the preservation of forestry and the establishment and maintenance of parks and reservations in the United States. Among his works are *The Mountains of Cali-*

*fornia, Our National Parks, The Yosemite*, 1912, and *The Story of My Boyhood and Youth*, 1913. Muir died at Los Angeles, Calif., Dec. 24, 1914.

**MUIR WOODS**, a national monument named in honor of the late JOHN MUIR, is situated on the lower western slope of Mount Tamalpais on the Marin Peninsula, Calif., across the bay from San Francisco. About 295 acres containing a remarkable grove of redwoods, *Sequoia sempervirens*, was established as a national monument by presidential proclamation, Jan. 9, 1908. The area was subsequently enlarged to approximately 426 acres, Sept. 22, 1921. Trees in this grove attain a maximum height of 240 ft. and some are 10 to 15 centuries old. A circumference of 40 ft. and diameter of 15 ft. are not at all unusual.

This wonderful grove is within 20 mi. of San Francisco. From here there is ferry boat and electric railroad connection to Mill Valley whence automobiles traverse the Muir Woods Toll Road to the entrance.

**MUKAČEVO**, a Czechoslovak city in Carpathian Russia with Jewish, Magyar and Ruthenian inhabitants. A tobacco factory, iron foundry and oil refinery comprise the principal industries. Grapes are grown in the environs. A fortress in early times, Mukačevo was fought for by Ruthenian, Serbian, Hungarian and Transylvanian princes and was Hungarian for several centuries. Pop. 1930, 26,123.

**MUKDEN**, the name given by the Russians to the capital of the Chinese province of Liaoning, formerly Fengtien, in Manchuria. Formerly the Chinese name of the city was the same as that of the province, Fengtien, but in 1928 the city's name was officially changed to Shenyang.

**MUKDEN, BATTLE OF**, the final battle of the Russo-Japanese War, 1904-05. After the fall of Port Arthur in Jan. 1905 Russian troops retreated towards Mukden, their base of supplies in South Manchuria. Trenches were dug for 47 miles to cover the city, and the Japanese also had their front along this whole distance. Approximately 310,000 men were engaged on each side. The battle started on Feb. 21, 1905, and the Japanese entered the city on Mar. 10. The capture of Mukden by the Japanese brought the collapse of the Russian defence in Manchuria. Neither side was in a position to push the war further, however, and so both agreed to the proposal of President Roosevelt that peace be made. See PORTSMOUTH, TREATY OF PEACE OF.

**MULBERRY**, a genus (*Morus*) of trees of the mulberry family several of which are cultivated for their fruit, for their leaves, used as food for silkworms, or for ornament. There are about 10 species, together with numerous varieties and races, found in north temperate regions. They are mostly medium-sized trees with a milky juice, bearing entire or three-lobed, finely toothed leaves, minute flowers and a juicy, black, berry-like fruit. The white mulberry (*M. alba*), native to Asia and naturalized in Europe and the United States, is invaluable for silk culture, the leaves forming the chief food of the silkworm. The black mulberry (*M. nigra*), native also to Asia, is widely planted in

southern Europe, in the Gulf states and in California for its pleasantly flavored fruit. Two native species occur in the United States, the red mulberry (*M. rubra*), widely distributed from Massachusetts to South Dakota and southward, and the Mexican mulberry (*M. microphylla*), found along the Mexican border.

Of the many ornamental forms developed in cultivation, one of the most popular in America is Teas' weeping mulberry (*M. alba* var. *pendula*), an elegant small tree suitable for lawns.

**MULE** (*Mulus*), the most ancient and most useful of hybrid animals, offspring of a mare and a male ass. The hinny (*hinny*), sired by a horse bred to a female ass, is less valuable. A good mule shows the equine strain in height, body conformation, coat and dentition, as well as in strength; the asinine, in hairless tail, thin limbs, shape of head, and in endurance, patience and equilibrium. It surpasses both parents in intelligence, longevity and resistance to climate and disease. Under certain conditions of land and labor, mules are more profitable than horses as work animals, being used especially for army transport, on southern plantations under Negro drivers, and in various European countries.

Earliest recorded history shows the mule in constant use. The Romans especially bred mules for driving and transport. To-day France is the leading European country in mule-breeding, this industry centering in Poitou, in Dauphine, near the Pyrenees and in the central mountainous sections. Spain, where fine mules outrank horses for carriage use, also rears the animals for burden bearing in the mountainous districts. Among the chief foreign breeds are the Andalusian, Maltese, Catalanian, Italian and Majorcan.

In the United States, mule breeding is largely confined to the South and Southwest. In 1910 there were more than 4,500,000 in the country; in 1930, 5,322,000, largely in Texas, Alabama, Arkansas, Georgia, Kansas, Kentucky, Mississippi, Missouri, Oklahoma and Tennessee. The American mule is a combination of breeds, of dark coat and of two recognized sizes, the large, or sugar mule, and the small, or cotton mule. G. E. F.

**MULE RAISING.** The mule is the hybrid animal which results from crossing a jack or male ass with a female horse. The much less common reverse cross, a stallion with a female ass is properly called a hinny. In conformation mules resemble each of their parents in some respects but differ in others. The ass is seen in their comparatively large heads, long ears, roached manes, slim tails and narrow, pointed hoofs; the horse in their symmetry and size. Other characteristics are longevity, docility and intelligence. In one striking respect they differ from either of their parents: the males are invariably sterile, the females almost always so. Hinnies are often capable of procreation.

From early times, especially in Roman agriculture, mules have been valued. The leading Old World

types are those of Catalonia, Andalusia, Majorca and Malta. From early colonial days they have been used in America. The first record of imported jacks was in 1591 by the Spaniards, probably into Mexico, which has become one of the leading mule-producing countries of the world. Others are France, Spain, Italy and the United States. One of the first Americans to produce mules was George Washington. His example was soon popularly followed so that during the first half of the 19th century the United States took leading rank in this branch of agriculture. Important mule raising states are Kentucky, Tennessee, Texas, Georgia, Missouri, Kansas and Oklahoma. The first two have been specially noted since the early days, partly because many celebrated jacks were imported from the European countries mentioned above.

Although soil and climate profoundly influence the strength and stamina of the animals raised on and in them, it has recently been proved that breeding from the best types and care in choice of feeds are at least as important.

Among the reasons why mule raising is still conducted, in spite of the popularity of the auto truck and the tractor, are lower cost to breed and raise them than horses to salable size; shorter time to prepare them than colts for market; greater salability of young ones at any period of their development and in less limited numbers; higher prices than for colts of relatively equal quality and value; greater immunity to disease and less danger of serious accidents to them. Because of these attributes mules are of special value in mountainous countries, in lumbering, mining and rough agriculture where it is infeasible to use horses, tractors, trucks, wagons, carts and power farming tools.

Where the ground is wet, marshy or irregular; where the footing is precarious or insecure; where courage, strength and calmness are required; where the climate is hot, sultry and dangerous to health, there, as a humble beast of burden the mule plays his supporting part until his labor done, he drops from old age.

#### MULES ON FARMS, U.S.

5-Year Average, 1927-31

Division	Value per Head	Number	% of Total
UNITED STATES	\$77.66	5,391,000	
LEADING STATES:			
Texas .....	67.20	1,005,000	18.6
Georgia .....	100.20	344,000	6.4
Mississippi .....	80.60	340,000	6.3
Arkansas .....	60.40	334,000	6.2
Tennessee .....	76.80	331,000	6.1
Oklahoma .....	53.20	331,000	6.1
Alabama .....	88.00	324,000	6.0
Missouri .....	69.40	318,000	5.9
Kentucky .....	66.60	265,000	4.9

Late in the 19th century the American Breeders' Association of Jacks and Jennets was formed to advance the breeding of asses and mules. Its first study book appeared in 1891 and since then other volumes have appeared at irregular intervals. M. G. K.



**MULHEIM**, a city in Rhenish Prussia, verging immediately on Duisburg, Oberhausen and Essen. Of the churches, only St. Peter's, 13-14th centuries, is old. It is a center of the coal mining and iron industry of the Ruhr district, has iron and steel works, foundries, machine and boiler factories and other industries. Mulheim has an active trade, particularly in coal; a coal research institute is located there. The city became Prussian in 1815. Pop. 1925, 127,400.

**MULHOUSE**, a city of northeastern France situated about 60 mi. south of Strasbourg; the most important manufacturing and textile center in Alsace. The burghers established themselves in control of Mulhouse as a free city in the 15th century, and when most of Alsace was annexed to France by the TREATY OF WESTPHALIA, the republic of Mulhouse joined the Swiss confederation of which it remained an autonomous part until 1798 when it voluntarily united itself to France. Ceded to Germany in 1871 it was restored to France after the World War. Mulhouse chiefly manufactures cotton textiles. Pop. 1931, 99,534.

**MULLEIN**, the general name for a numerous genus (*Verbascum*) of large perennial herbs of the figwort family. There are about 300 species, mostly biennials, native chiefly to the Mediterranean region, several of which have become widely naturalized as weeds in North America. They are tall, erect, strong-growing plants with coarse, more or less toothed, alternate leaves and showy flowers in long terminal clusters. The great mullein (*V. Thapsus*), densely woolly all over, with a wing-angled stem, grows sometimes 7 ft. high. It bears large, thick, velvety leaves, often a foot long, and numerous yellow flowers, an inch broad, in a dense, elongated spike. The Romans, who called the plant candelaria, dipped its dried stalks in suet to burn at funerals.

**MÜLLER, MAX** (1823-1900), German-English Orientalist and philologist, was born at Dessau, Dec. 6, 1823, the son of the German poet Wilhelm Müller. He studied at the universities of Leipzig and Berlin and in Paris. In 1845 he edited the *Rig Veda* which was published at Oxford in 1849-74. Because of his liberal religious views he failed to secure election to the chair of Sanskrit at Oxford and in 1868 a chair of comparative philology was created for him. His greatest single work was the editorship of *The Sacred Books of the East* in 51 volumes of which he himself contributed three. He served as curator of the Bodleian Library, as a delegate of the University Press and as member of the Priory Council. Müller died at Oxford, Oct. 28, 1900.

**MÜLLER, WILHELM** (1794-1827), German lyric poet and novelist, was born in Dessau, Oct. 7, 1794. He is considered the leading lyrical poet of the Berlin school of Romantic poets. The soul of folk-song is in his poetry, which sings the simple joys and tragedies of the miller, the shepherd, and the bugler. Müller received special fame through his *Poems of a Traveling Bugler*, 1821-24, written after he had fought in

the War of Liberation against the French. His leading love poems and popular songs were set to music by Schubert and have become household melodies. Müller's son was the noted Orientalist, Max Müller. The poet died at Dessau, Sept. 30, 1827.

**MULLET**, the name for a numerous family (*Mugilidae*) of spiny-rayed fishes allied to the silversides and barracudas, all more or less valued for food. Most species inhabit shallow bays and estuaries, but some live wholly in fresh water; several species are found in North America. They have rather stout bodies, 1 to 2 ft. long, blunt heads, small mouths with very feeble teeth, and large scales. In color they are bluish-silver, often with pale blue stripes. The best known is the common striped mullet (*Mugil cephalus*), an excellent food fish of cosmopolitan range in warm and temperate seas. It moves in schools and subsists upon minute vegetable matter, which it sifts out of the sand and mud by means of its long gill-rakers. In 1929 the total catch of mullets in United States waters was 33,816,000 lbs., valued at \$1,340,000. See also BARRACUDA; SILVERSIDE.

**MULLIGAN LETTERS**, a selection of letters written by JAMES G. BLAINE to Warren Fisher, a business associate, alleged to show that Blaine, while Speaker of the House, had used his influence to secure legislation favorable to the Little Rock and Fort Smith Railroad, in which he was personally interested. The letters, in the possession of James Mulligan, once Fisher's clerk, were cited in 1876 in an attempt to discredit Blaine's candidacy for the Republican nomination to the presidency. Blaine secured the letters, and, forestalling his enemies, read them before the House. His self-vindication was inconclusive, and the letters were again cited by Blaine's enemies in the campaign of 1884.

**MULLION**, a slender upright division, usually of stone, but sometimes of wood, and in modern windows often of metal, between the lights of a window. Mullions not only furnish supports for the window heads, but also serve to divide the whole large window area into areas easy to glaze, either with fixed panels of leaded glass, or with movable sash. The development of window tracery in GOTHIC ARCHITECTURE gave great importance to the mullion. In secular and domestic architecture the desire for simple shapes in the windows led to the gradual development of the rectangular windows of the late French Gothic, divided into four sections by a vertical mullion and a horizontal transom, and in England to the long bank of windows with many lights and mullions that form a characteristic feature of Tudor and Jacobean houses.

**MULTIPLE PROPORTIONS, LAW OF.** See DALTON'S LAW.

**MULTIPLE STARS**, the name given to a group of more than two stars that are physically connected. Thus Mizar is a multiple star consisting of at least five components, CASTOR of six.

**MULTIPLICATION**, in positive abstract integers, the process of taking one of two numbers, the multi-

plicand, as many times as there are units in the other, the multiplier, the result being called the product. Thus we say, "2 times 3 is 6," 3 being taken twice, so that  $2 \times 3$  means essentially the same as  $3 + 3$ . The definition and the meaning of "times" have been extended from time to time so as to include multiplication involving all other types of numbers, as in the cases of

$$\frac{2}{3} \times \frac{3}{4} = \frac{1}{2}, \quad -3 \times 1\frac{1}{2} = -5\frac{1}{2}, \quad \sqrt{2} \times \sqrt{6} = 2\sqrt{3}, \\ (-\frac{1}{2} + \frac{1}{2}\sqrt{-3})(-\frac{1}{2} - \frac{1}{2}\sqrt{-3}) = 1,$$

$$\text{and} \quad (a + 2b)(a - 2b) = a^2 - 4b^2.$$

For the commutative and associative laws, see NUMBERS, THEORY OF.

**MULTNOMAH FALLS**, a celebrated cataract on the Columbia River, occurring in Multnomah Co., Oregon. It is the culmination of a rushing mountain stream, fed by melting snows, which spills over the edge of a towering cliff and descends 607 ft. into a dark pool within a recess of the mountain. Being mostly spray when it reaches the pool, the fall makes comparatively little noise. The waters regather in the pool, out of which they flow into the Columbia River. The falls were named for the Indian girl, Multnomah, who, according to legend, hurled herself from the cliff, the present site of the falls, as a sacrifice to save her lover and her people from annihilation by a plague. She was buried at the foot of the cliff and as the tribe prayed to the Great Spirit to give them a sign that her sacrifice was not in vain, a stream of water began pouring from the ledge high above. To the Indians this was the spirit of Multnomah.

**MUMFORD, LEWIS** (1895- ), American author, was born at Flushing, Long Island, N.Y., Oct. 19, 1895. He studied at the College of the City of New York, Columbia University and the New School for Social Research. He was associate editor of the *Fortnightly Dial*, 1919, acting editor of the *Sociological Review*, London, 1920, lecturer at the New School for Social Research, 1925, and at the School of International Studies, Geneva, in 1925 and in 1929. Among Mumford's works are *Civilization in the United States*, by 30 Americans, 1922, *Sticks and Stones*, *The Golden Day*, 1926, *Herman Melville*, 1929, *American Taste*, 1929, and *The Brown Decades*, 1931.

**MUMPS**, or **PAROTITIS**, a specific infective disease of children, characterized by swelling of the salivary glands, especially the parotid gland of the cheek. The condition is not caused by a bacterium, but by a virus which will pass through the finest clay filters. It is infective and usually occurs in epidemics. From two to three weeks elapse after the disease is contracted before symptoms develop. There is considerable swelling and tenderness of one or both cheeks in front of and below the ear, together with some fever. The symptoms subside in about a week, but for three weeks there is danger of transmission to persons who have been with the patient. Frequently the disease affects the testis where it causes considerable

pain. Rarely it may affect the pancreas or brain. (See also STERILITY.)

Treatment of the ordinary form is limited to rest in bed, liquid and semi-solid foods, and compresses to the cheek.

**MUN, THOMAS** (1571-1641), English merchant and writer on economics, was born at London in 1571. Engaged in Mediterranean trade, he was made in 1615 a member of the East India Company. In 1621 Mun published his *Discourse on Trade from England into the East Indies*, a refutation of the charge that this trade drained England of bullion. More important is his book, *England's Treasure by Foreign Trade*, an exposition of the theory of the balance of trade. Mun died in 1641.

**MUNCH, PETER ANDREAS** (1810-63), Norwegian historian, born at Oslo (Christiania), Dec. 15, 1810. As a schoolboy, he taught himself to read the ancient Sagas in the original language. When he entered the university he specialized in history and languages. He became a professor, but he preferred research and writing to teaching and lecturing. He traveled widely and spoke most of the European languages fluently. Such was his command of Swedish, German and English that he wrote treatises in each of those tongues. His chief work was his *History of the Norwegian People* in eight volumes. It was brought to an untimely close by his death when he had brought the story down to the Kalmar Union in 1397. As a historian, Munch was distinguished for his painstaking and critical research and for the clarity of his writing. He died at Rome, May 25, 1863.

**MUNCHAUSEN, BARON**, the hero and the fictitious author of a book of fantastic adventures, first issued in English by Rudolph Erich Raspe, 1785. The name probably refers to Hieronymus Karl Friedrich von Münchhausen (1720-97), a German officer in the Russian service.

**MÜNCHEN.** See MUNICH.

**MÜNCHEN-GLADBACH**, a city in Rhenish Prussia grown together with its neighboring city, Rheydt. Among noteworthy buildings are the minster, 11-13th centuries, the rathaus of the 17th century, a former Benedictine abbey, and the Rheydt castle, a 16th century Renaissance building. There are spacious parks. The city is the center of the Rhenish-Westphalian cotton industry and has various minor industries; technical colleges for the textile industry are located there. Pop. 1925, 115,302.

**MUNCIE**, a city of north central Indiana, and county seat of Delaware Co., on the White River, 54 mi. northeast of Indianapolis. The Big Four, Chesapeake and Ohio, Pennsylvania and the Nickel Plate are among the railroads serving Muncie; a municipal airport is accessible to the business section. It is situated in a coal region and is the commercial center of an extensive area. Among its diversified industries, the manufacture of automobile equipment is outstanding. In 1929 the industrial output reached approximately \$65,000,000; the retail trade amounted

to \$26,502,584. The city has an attractive residential district and is the seat of Ball Teachers' College, founded in 1918. Muncie takes its name from the Indian Tribe of Munsees. As a city it dates from 1865, but was founded about 1833. Pop. 1920, 36,524; 1930, 46,548.

**MUNDA (KOL)**, a distinct LINGUISTIC FAMILY spoken in the hills of Chota Nagpur and of the Central Provinces of India, its best known dialects being Mundari and Santal. It does not distinguish genders by sex, but as animate and inanimate. Verbal roots are modified by infixes, e.g., an infixed *p* makes a reciprocal verb and suffixed *o* gives a passive or intransitive meaning; infixes also help form abstract nouns or names of instruments. Pronouns, whether direct or indirect, are either suffixed to the verb or infixed between the elements of the root.

The speakers of Munda now number less than 3,000,000, but formerly they seem to have occupied a much larger area, since traces of their influence are said to be found in some South-Himalayan TIBETAN dialects, and SANSKRIT also has some words of Munda origin.

A certain number of linguistic phenomena have been shown to be common to Munda and MON-KHMER, such as implosive final consonants, numerals, and distinction between inclusive and exclusive pronouns ("we and you," "we, but not you"), etc., and some scholars group both families, including ANNAMESE, in a so-called AUSTRO-ASIATIC group, although genetic relation between them cannot yet be said to have been definitely proved. J. B.

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**MUNDELEIN, GEORGE WILLIAM** (1872- ), American cardinal, was born in New York, July 2, 1872. He was educated at Manhattan College, New York City, St. Vincent's Seminary, Beatty, Pa., and at Urban College of Propaganda at Rome. Ordained in 1895, he became secretary to Bishop McDonald of Brooklyn, and until 1897 was pastor in Williamsburg, Pa., at which date he was appointed chancellor of the diocese. In 1903 he was appointed Censor of the Liturgical Academy, at the time the only American holding that office. From 1909 to 1915 he was Auxiliary Bishop of Brooklyn, resigning to become Archbishop of Chicago, and in 1924 was elevated to the cardinalate. Cardinal Mundelein was the founder and president of the Seminary of St. Mary's of the Lake at Mundelein, Ill.

**MUNHALL**, a borough of Allegheny Co., Pa., on the Monongahela River, 7½ mi. southeast of Pittsburgh. It is served by the Pennsylvania and the Pittsburgh and Lake Erie and the Union railroads, motor buses and a nearby airport. Part of the Homestead district of iron and steel production, Munhall was planned as a residential section for steel corporation employees and was named for John Munhall. Munhall was incorporated in 1901. The Homestead Steel works, whose steel products are valued annually at approximately \$100,000,000, lie largely in Mun-

hall. In 1929 the retail trade amounted to \$1,511,401. Natural resources also include gas and coal. Gen. Edward Braddock's defeat, in 1755, occurred nearby. Charles M. Schwab, the steel magnate, once resided here. Pop. 1920, 6,418; 1930, 12,995; 15% foreign-born.

**MUNICH** or **MÜNCHEN**, capital of the German free state of BAVARIA, located on the Upper Bavarian plateau and the Isar River, connected by 10 bridges. The oldest part of the city is the Old Court, the first residence of the sovereigns on Marienplatz, which also contains the old rathaus and St. Peter's Church. This nucleus expanded in the 13th and 14th centuries, forming the present old city, which is bounded by four city gates and the new, formerly royal, palace on the north. The west side is surrounded by promenades and the principal streets are handsome and spacious, particularly the splendid Ludwigstrasse. Among the squares are Karlsplatz with two fine fountains, the Marienplatz with the famous statue of the Virgin Mother on a high column, and many others with monuments and fountains.

**Public Buildings and Parks.** Of the churches, 57 Catholic, 7 Protestant and 1 Hebrew, the Frauenkirche, 1468-88, dominates the city with its two high towers and contains the tomb of Emperor Ludwig the Bavarian. Others are St. Peter's, 12th century, Holy Ghost, 15th century, Greek Church, 15th century and the Ludwig's Church, a modern basilica. Several of the Baroque churches are also of interest, as the Theatiner Court Church. Prominent among the secular buildings are the old rathaus, 14th-15th centuries; archiepiscopal palace, 18th century; Old Court, 13th century; former royal residence, 16th century; Residence Theater, 18th century; Old Pinakothek, picture gallery, 1826; New Pinakothek, Glyptothek and Castle Nymphenburg, 17-18th centuries; the State Theater; Prince Regent Theater; Hofbrauhaus; and various palaces, museums, and government and university buildings.

Besides the Old and New Pinakothek, with their paintings, the Glyptothek, with rare collections of antique sculpture, and the German Museum, with masterpieces of science and technique, there are other galleries of importance and many museums with special collections.

The English Garden and Court Garden are celebrated as well as the Oktoberwiese, where festivals are held, but there are a number of other parks in and about the city apart from the promenades.

**Commerce and Transportation.** Munich has important industries, particularly metal, machinery and clothing manufacture. It has besides many diversified small industries. The great breweries and beer halls are notable. There also is much artistic handiwork, including stained glass, china, embroidery and sculpture. The trade is chiefly in works of art. Munich is the chief railroad center in Bavaria and 12 lines converge in the main station.

**Education.** The university, founded in Ingolstadt in the 15th century, was finally transferred to

Munich in 1826. The technical university was consolidated with the commercial university in 1922. The Academy of Fine Arts, Academy of Music, Academy of Science and the Philosophic-Theological University of the Franciscans, are but a few of the numerous educational institutions. The state library has more than 1,500,000 volumes, exclusive of manuscripts and incunabula, and the libraries of the educational institutions, cathedral chapter and museums more than double the number.

**History.** Henry the Lion founded a mint at "Munichen" in 1158, but the sovereigns did not make it their permanent residence until the middle of the 13th century. After 1327 Emperor Ludwig the Bavarian gave Munich the aspect it presented at the beginning of the 19th century. Later monarchs enlarged and beautified the city and made it a center of art and science. Pop. 1925, 680,704.

**MUNICH, UNIVERSITY OF**, a major German university, situated at Munich, Bavaria. It was founded by Duke Ludwig of Bavaria at Ingolstadt in 1458, but was not opened till 1472. Catholic in the beginning, it remained so during the Reformation, and in 1566 was brought under the control of the Jesuits, by whom it was conducted till 1773. Through the influence of Ludwig Maximilian, it was moved from Ingolstadt to Landshut in 1802. In 1826 it was transferred to Munich, there to be reorganized and united with the Munich Academy of Sciences, founded in 1759. It is largely state-supported. The present university is well equipped with museums, laboratories, an observatory and a library of over 600,000 volumes. It has schools of theology, law, medicine and philosophy, and is attended annually by about 8,000 students. In 1930 the faculty of 397 was headed by Prof. Dr. Eduard Eichmann. Affiliated with the university are the Collegium Georgianum, founded in 1494 for Catholic priests, and the Maximilianum, a preparatory school, founded in 1852.

**MUNICIPAL COLLEGES.** See URBAN OR MUNICIPAL COLLEGES AND UNIVERSITIES.

**MUNICIPAL ENGINEER**, one charged with the responsibility of solving certain problems incident to a concentration of population within certain areas.

Where the population is sparsely distributed as in agricultural districts, the facilities afforded for the comfort, convenience and safety of the individual are usually simple. They are rarely of a character that requires a continuing engineering supervision during their installation and use. Where the population is highly concentrated the demands for social conveniences, individual comforts as well as the general peace, health and safety become continuous and more insistent, and at the same time more varied. The work of meeting these demands becomes more difficult, more highly technical and tends to become highly specialized in certain lines.

This specialization not only separates the required engineering activities from the efforts in other directions but also subdivides the engineering. Some of these specialized lines of engineering activity are not

peculiar to municipal service while some seldom appear elsewhere. The employing agency is not necessarily the municipality. Traffic engineers, pavement and sewer designers and building inspectors (see BUILDING INSPECTION) afford illustration of this class. Much of the engineering work is often gathered in one department and the head of that group designated as the City Engineer. P. A. F.

**MUNICIPAL GOVERNMENT.** City governments derive their form and powers from state governments. In Europe, including Great Britain, city government is provided for by general laws. In some American states each city receives a special CHARTER from the legislature. In others general laws are provided for cities of each population class, frequently offering alternative forms of government. Still other states permit cities to adopt "home rule" charters (see HOME RULE, MUNICIPAL). Cities are corporations with the right to hold property, sue and be sued, have a common seal, enjoy perpetual succession, etc. Of the powers of cities Judge Dillon says, "It is a general and undisputed proposition of law that a municipal corporation possesses and can exercise the following powers and no others: first, those granted in express words; second, those necessarily or fairly implied in or incident to the powers expressly granted; third, those essential to the accomplishment of the declared objects and purposes of the corporation—not simply convenient, but indispensable." In England the governing body of the BOROUGH is a council composed of councilmen (in larger cities elected by wards) and of aldermen, one-third the number of councilmen, elected by the council. The council directs the various activities of the city through committees under which professional officials actually administer the affairs of the departments. There is no general executive, the mayor being merely the presiding officer of the council. In Prussia the people of each urban *Gemeinde* elect by proportional representation a council which chooses a *burgermeister* and other professional officers for 12-year terms. These officers, with several laymen chosen by the council for four-year terms, constitute the *Magistrat*, the executive body of the city. The *burgermeister* controls police and police regulations and presides over the *Magistrat*. In France the COMMUNES (except Paris, for which there is a special law) are governed by councils of from 10 to 36 members; in Lyons, 57. The council elects a *maire* and one or more adjoints. The *maire* makes police regulations and appoints and directs the municipal police, subject to the control of the PREFECT of the Department. In both France and Prussia the initiative of the council is extensive, but most of its acts are subject to veto by the superior administrative authorities of the state.

In the United States three main types of municipal government have developed. 1. The Mayor and Council type, still exists in a majority of American cities. The people elect a mayor and some other administrative officials and a council, usually of one chamber. The mayor may veto some acts of the coun-

cil and the council may confirm or reject the mayor's appointments. In a few cities the mayor's power has been greatly extended by taking away the council's power of confirmation and giving the mayor the sole power of initiating appropriations. 2. Three or four hundred small cities have adopted the Commission form of government, vesting the powers of the city in usually five commissioners elected at large. One of the commissioners, elected mayor or chosen by his colleagues, functions as president of the commission. Each other commissioner is head of an administrative department. 3. In the Manager type, over 400 cities—15 having over 100,000 population—have a small council, as in the commission plan, which chooses a manager as administrative head of the city. He appoints and removes subordinates and, responsible only to the council, directs the affairs of the city. Cleveland, formerly the largest city-manager governed city, abolished this form in 1931. See also COMMISSION GOVERNMENT; CITY-COUNTY GOVERNMENT. T. H. R.

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**MUNICIPIUM**, a local unit of government of the Roman world, from which we derive our term municipality. The municipium was a self-governing unit and had a relative amount of independence. There were different classes of municipia, depending on the rights and privileges their citizens possessed. In many instances the duties were more numerous than the rights. Thus the subjects of a municipium might be required to render compulsory military service but not have the right to vote. The municipium looked after such things as the care of the poor and the local water supply, carried on various public enterprises, and provided for local taxation. In the organization of the municipium may be found the beginnings of some of our modern city government and institutions.

**MUNITIONS**, all supplies required by armies in the field. They range from the food and clothing required by the individual soldier to the large railway cannon used by the artillery. The effort of the nation at home during wars is devoted to the supply of men and munitions to the armies. During the World War the munitions effort was coordinated in England through a Munitions Ministry, a department of the National Government. In the United States it was coordinated by the War Industries Board. Under United States laws in 1931 the work was provided for in the cabinet departments concerned with national defense by assistant secretaries.

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**MUNKACSY, MICHAEL** (1844-1900), Hungarian painter, who changed his name of Lieb to Munkacsy, in honor of his native city, Munkacs, where he was born Feb. 20, 1844. Having lost his parents early he pursued his chosen career with difficulty, but was finally enabled to study in Vienna, Munich, and under Knaus in Düsseldorf. His preference was for dramatic subjects and he made a sensation with his picture *The Last Day of a Condemned*

*Man*, exhibited in 1870 in Paris. Two years later he took up his residence in the French capital, where he continued to enjoy great popularity. The artist's most noted picture is his *Christ Before Pilate*, now in the John Wanamaker collection in Philadelphia. Other well-known canvases are *Milton Dictating "Paradise Lost" to his Daughters*, in the New York Public Library; *The Last Moments of Mozart*; and a *Christ on Calvary*. The artist suffered a mental breakdown, and died in a sanitarium near Bonn, May 1, 1900.

**MUNSEE**, a North American Indian tribe, one of three divisions of the Algonkian DELAWARE. The other two divisions, the Unami and Unalachtigo, were dialectically diverse. The Munsee, like the Delaware, were divided into three gentes. They occupied formerly the headwaters of the Delaware River in New York, New Jersey and Pennsylvania, extending southward to the Lehigh River and to the west bank of the Hudson from the Catskills to the New Jersey line. They were divided into six groups, the most important of which, the Minisink, was often confused with the Munsee proper. The Hudson River bands played an important part in the early history of New York, but pressure from the whites forced them to join their cognate tribes on the Delaware, whence they were later forced to remove to the Susquehanna, and then to the Allegheny River in Pennsylvania. Some moved west with the Delaware to Indiana and joined that tribe, while others joined the Chippewa, Shawnee and other groups, so that the tribal identity was eventually lost. Under the influence of Moravian missionaries a few Munsee moved to Canada, there forming a group now called Moravian Indians.

**MUNSEY, FRANK ANDREW** (1854-1925), American newspaper and magazine publisher, was born at Mercer, Me., Aug. 21, 1854. He began work in a country store, his spare time being devoted to studying telegraphy; but after serving a few months as an operator, he became manager of the Western Union telegraph office at Augusta, the state capital. In 1882 he went to New York, where he launched a juvenile magazine, the *Golden Argosy*, reorganized for adult readers as the *Argosy*. The magazine reached a circulation of 115,000 copies in 1891. He established *Munsey's Magazine* (1889), the *Railroad Man's Magazine* (1906) and the *All-Story Weekly* (1904). Munsey entered the New York newspaper field in 1891, buying the *Star*. He also purchased newspapers in several eastern cities. In 1916 he purchased the New York *Sun*, and in 1920 acquired the New York *Herald*, with the *Evening Telegram*. After a series of mergers, which caused the discontinuance of the competitive *Globe* and the *Evening Mail*, Munsey in 1924 sold the *Herald* to the New York *Tribune*. He died at New York City, Dec. 22, 1925, leaving most of his wealth to the Metropolitan Museum of Art in that city.

**MÜNSTER**, capital of the Prussian province of Westphalia, located about 94 mi. west and south of Hanover on the Münster and Dortmund-Ems canals. Since the time of Charles the Great it has been the

seat of a bishopric. In the 13th and 14th centuries it was a flourishing Hanseatic city, almost independent of episcopal power. In 1803 the ecclesiastical principality was secularized and became Prussian. The city is still medieval in aspect, having gabled houses, arcades, St. Lambert's Church, "a pearl among the Gothic buildings of Westphalia," and an impressive rathaus built in the 14th century, where the Treaty of Westphalia was signed to end the Thirty Years' War. The cathedral, the largest church in the province, nobly proportioned and in the transition style, was built in 1225-61 on the site of an earlier edifice. The churches of St. Ludgerus, the first bishop, and of Our Lady are also noteworthy. The former palace of the prince-bishops, built in 1767, is an imposing Baroque building standing in a large park. There are also handsome 18th century town houses of the wealthy Westphalian nobility. The former university, built in 1793-1818, has been reestablished. There are various industries, including weaving, the manufacture of furniture, machines, religious articles, jewelry and leather; there is trade in coal, lumber, petroleum and wool. Pop. 1925, 106,418.

**MÜNSTERBERG, HUGO** (1863-1916), German-American psychologist, was born at Danzig, June 1, 1863. He received his Ph.D. from Leipzig in 1885 and his M.D. from Heidelberg in 1887. His work in psychology began at Freiburg, where he had a private laboratory in his own home. He was invited to Harvard in 1892 to take charge of the newly founded laboratory there. His interest in psychology was mainly physiological and experimental. In his later years he gave considerable attention to applied psychology. Münsterberg was also a critic of American life, and his pro-German sympathies made him unpopular during the early part of the World War. He died in his classroom at Harvard, Dec. 16, 1916.

Among his works are: *Psychology and Industrial Efficiency*, 1913; *Psychology: General and Applied*, 1914; *The War and America*, 1914; *The Peace and America*, 1915; *The Eternal Values*, 1909; *American Traits*, 1909, and *Psychology and the Teacher*, 1909.

**MÜNTZ METAL.** See BRASS.

**MURAENA**, a genus of very voracious, often brilliantly colored eels of the moray family (*Muraenidae*), found widely in warm temperate and tropical seas. They are frequently about 5 ft. long, with thick leathery scaleless skin and a long fin beginning at the head and extending along the back and around the tail to the vent. Possessing powerful jaws these eels are exceedingly pugnacious, seizing their prey or inflicting serious wounds upon their enemies with their usually knifelike teeth, not hesitating to attack human beings. The widely known Old World muraena (*Muraena helena*), a valuable food fish, common in the Mediterranean region and occurring also in the Indian Ocean and on the coasts of Australia, sometimes attains a length of 8 ft. The Romans, who expended large sums upon aquaria for the propagation of this fish, considered its white flesh one of the greatest of delicacies. See also EEL.

**MURAL PAINTING IN AMERICA.** Mural painting was one of the latest of the arts to develop in the United States. The wall paintings of American landscapes in panoramic form, found as early as 1712 in New England and in the famous mansion-houses of the South, are among the earliest examples of the art as practised in this country. As late as 1850 the walls of Alsop House, Middletown, Conn., were decorated in this manner by the Italian refugee painter, Brumidi, who had been commissioned to fresco the Capitol dome at Washington. However, the beginning of mural painting on a scale suitable to large public buildings was made in 1824 when Congress commissioned John Trumbull, Robert Weir and Emanuel Leutze to decorate the rotunda of the Capitol. These large canvases were rather faithful historical records than mural painting in the accepted sense of the term; that is, a painted scheme of wall decoration, conforming to the structure and purpose of the building it would enrich through the character of subject and composition, and bound together by a harmonious coloring.

A group of artists trained in France had come to recognize that a building planned for a given purpose, with beauty as well as utility inherent in the design, must coordinate structural enrichment in the interior as well as in the exterior masses. One of these men, H. H. Richardson, architect for Trinity Church, Boston, sought out JOHN LA FARGE, a master decorator of broad and varied training, as the one artist in America capable of designing and executing the entire interior decoration from the smallest details of modeled ornament to figure composition, and of uniting all parts in a harmonious color scheme. The success of this undertaking led to a further collaboration of architect, sculptor and painter in the decoration of St. Thomas Church, New York City, destroyed by fire in 1904. There followed the decoration of a number of other churches and private dwellings, culminating in the painting of the chancel wall of the Church of the Ascension, New York City. The *Ascension of Christ* was the largest and most important figure composition undertaken by La Farge. Meanwhile, WILLIAM M. HUNT, a former teacher of La Farge, was decorating the vaulted ceiling of the State House at Albany with two large lunettes, *The Discoverer* and *Flight of the Night*. Due to faulty construction of the ceiling these admirable decorations were destroyed.

The World's Columbian Exposition of 1893 at Chicago opened up a new phase of mural painting and offered great opportunities in the decoration of the commercial building. F. D. Millet was director of the gigantic scheme of decoration, and gathered about him a considerable group of notable artists who were, however, inexperienced in this monumental type of composition. While the results were highly praised, it may have been fortunate that within ten years this work was obliterated; through it, however, artists and public alike had gained experience and a widened outlook. The next important mural painting commissions came from the Library of Congress and the Boston Public

Library. The artists selected for the decoration of the walls of the latter were Puvis de Chavannes, J. S. Sargent, E. A. Abbey and J. M. Whistler. Chavannes stood as the one great mural painter of the time. He was reluctant to undertake the decoration of a building he had not seen; but a model was sent him and he was able successfully to produce his panels. Neither Sargent nor Abbey had attempted mural decoration, but nevertheless proved notable in this medium. Sargent's methods of handling two series of decorations, widely spaced in time, and of handling others also, differed greatly. They varied from high relief and bright color to flatness and dull color, or low relief and blonde tones, while his war paintings for the Widener Memorial Library at Harvard struck still another note. Abbey was called upon to magnify his delicate idealism to heroic dimensions and power. This he did with a firm grasp, losing none of the richness of decorative narrative, in his *Quest of the Holy Grail* which hangs in the library. Whistler had agreed to paint a large panel for the reading room, but the work was never finished.

The decoration of the Library of Congress was the first great opportunity for true mural painting. Each of a score of well-known artists, all subservient to a structural plan, was given a separate room or ceiling to decorate. Blashfield's compact design for the collar of the great dome marked the eight ribs which it clamped together with eight principal figures, exemplifying the relation of functional decoration to structure. Elihu Vedder's lunettes of *Corrupt Government* showed a fine combination of realism and idealism, his mosaic panel of *Minerva* was one of his maturest achievements. The six lunettes by Alexander of the *Evolution of the Book* are excellent and stimulating examples of story-telling art. The same power is manifest in this artist's modernized allegory of the development of the steel industry, in the Carnegie Institute at Pittsburgh. Other artists who did notable work in the national library were Cox, Pearse, Van Ingen, Walker, Benson, Reid and Simmons.

State and city buildings have offered their walls to the painter in increasing numbers. Among the first were the Criminal and Appellate Courts in New York City and the State Houses at Boston, St. Paul, Des Moines, Madison and Lincoln. The State House at Harrisburg, Pa., offered the largest single order ever placed in America. Abbey, in accepting it, brought to this labor of love for his native state the best of his versatility and accurate antiquarianism; he died, however, when the work was half finished. Violet Oakley was selected to design and execute the remainder. A great illustrator, like Abbey, she kept to his narrative style, giving the spiritual significance of the inauguration of liberty of conscience through Penn and the Society of Friends. Mowbray is an artist excellently equipped to carry out a blending of the eclectic and archaeological atmosphere in colleges and libraries.

The Cunard building in New York City presents an example of decoration in the business

building. Ezra Winter, the artist, had the collaboration of both architect and engineer. The modern practice of gluing the finished canvas to the wall was not feasible, for the concave surface of the vaulted ceiling had to be covered. Fresh from his academic studies in Rome, Winter turned to the Pompeian method of *secco fresco*, that is, painting direct on the wall with lime water colors mixed with a binding medium. He proved that the subject with widest and most vivid appeal was that which illustrated the interests of the immediate surroundings. He treated the romance of the sea and ships in the four large lunettes of the vessels of Leif Ericsson, Columbus, Cabot and Drake. The spirit of these works was supplemented by Faulkener's quaint picture maps, following the lines of the sea charts of those early navigators.

The large banks and trust companies and their small branches are decorated by the best known mural painters. Albert Herter has turned his resourceful genius to tapestry composition; but his glowing pageant of the nations bringing gifts to California, which decorates the dining room of the St. Francis Hotel in San Francisco, shows him as an outstanding mural painter. Other American mural painters of distinction are: Howard Pyle, Maxfield Parrish, George Maynard, F. C. Bartlett, Will Low, Abbott Thayer, Elmer Garnsey, Robert Blum, Kenneth Hayes Miller and Thomas Benton.

**MURAT, JOACHIM** (1767-1815), marshal of France and King of Naples, was born at La Bastide-Fortuniera on Mar. 25, 1767. He enlisted in a cavalry regiment and soon received promotion. Serving under Napoleon, he followed the conqueror over Europe, and in 1800 married Napoleon's sister Caroline. After having received many honors, posts and titles, Napoleon finally appointed him king of Naples, but their relations soon became less friendly and, on the downfall of the Emperor, Murat was forced to surrender his kingdom to Ferdinand IV, the rightful ruler. Attempting to regain it, he was taken at Pizzo and condemned to death. He was shot on Oct. 13, 1815.

**MURATORI, LODOVICO ANTONIO** (1672-1750), Italian historian, was born at Vignola on Oct. 21, 1672. He was educated at the University of Modena, and in 1694 took his degree as doctor of law. Two years later after his ordination he became a member of the research division of the Ambrosian Library, Milan, a position he held until the beginning of the 18th century, when he became archivist of the Este library at Modena. His greatest work, *Rerum Italicarum Scriptores*, an edition of Italian history, in 28 volumes, caused Muratori to be styled the "father of Italian history." He died in 1750.

**MURCHISON FALLS**, a waterfall of the Nile River, occurring 270 mi. from its outlet, in 2° 18' N. lat. and 31° 30' E. long. A rapid descent between steep forest-covered hills brings the Victoria Nile into a fissure about 18 ft. wide, where it falls 120 ft. into an abyss. Sir Samuel Baker, who discovered the



waterfall, named it after the geologist, Sir Roderick Murchison.

**MURCHISON LETTER**, an artifice of the presidential campaign of 1888, designed to alienate the Irish vote, normally Democratic, from President Cleveland, candidate for reelection. George Os-goodby, a Republican party worker of Pomona, Cal., wrote to the British Minister at Washington an inquiry, fictitiously signed Charles F. Murchison, purporting to be from an American voter of British birth uncertain whom he should support in the forthcoming election. The Minister, Sir Lionel Sackville-West, replied that Cleveland was most likely to respect British interests. This injudicious letter was published on Oct. 24. Cleveland was inclined to ignore the indictment, but was persuaded by his advisers to repel the imputation of un-Americanism by demanding that the Minister be recalled. The British Government in resentment refused to fill the vacancy until Cleveland had retired from office.

**MURCIA**, a city of Spain, capital of the province and former kingdom of the same name, located in a fruitful, well-watered valley. Murcia was wrested from the Moors about 1266. It has a large, richly appointed cathedral begun in the late 14th century and added to in the 16th and 18th centuries. An episcopal palace, a Moorish granary, schools, a theater, a museum, parks and wide streets give charm to the city. Fruit growing and the raising of silkworms, the production of olive oil, silk goods, soda, salt-peter and powder are the chief industries, together with the manufacture of musical instruments. Est. pop. 1929, 156,485.

**MURDER**, the unlawful killing of a human being with malice aforethought. The term malice in this formula has several meanings. Primarily it means a specific intent to kill, and malice aforethought means a deliberately executed intent of that sort. By extension of this original idea it includes a wanton and reckless indifference to life under circumstances where life is manifestly endangered, and a killing in the course of commission of a felony, at least a felony dangerous to life.

**MURFREE, MARY NOAILLES** (1850-1922), American novelist, was born at Murfreesboro, Tenn., Jan. 24, 1850. She grew up in her native town, and it was this general environment of which she wrote under the pen name of Charles Egbert Craddock. Among her books are *In the Tennessee Mountains*, *The Prophet of the Great Smoky Mountains*, *The Mystery of Witchface Mountain* and *The Bushwhackers*. She died at Murfreesboro, Aug. 1, 1922.

**MURFREESBORO**, a city in central Tennessee, the county seat ofutherford Co., situated near Stones River, 30 mi. southeast of Nashville. Buses, airplanes and the Nashville, Chattanooga and St. Louis Railroad afford transportation. The city is a large shipping market for red cedar, live stock, dairy products and grain. The principal manufactures are hosiery, lumber and milk products. Murfreesboro is the seat of Tennessee College for Women and Middle Ten-

nessee Teachers College. Near by are Stones River National Cemetery and Military Park, the scene of the battle of Stones River, often called the battle of Murfreesboro. Murfreesboro was incorporated in 1811. Pop. 1920, 5,367; 1930, 7,993.

**MURFREESBORO, BATTLE OF**, Dec. 31, 1862-Jan. 2, 1863, a bitterly contested engagement of the CIVIL WAR. Learning that Gen. Bragg had advanced from Chattanooga 30 miles to Murfreesboro, to take up winter quarters, Gen. Rosecrans, commanding the Federal Army of the Cumberland, 44,800 men fit for duty, marched from Nashville to give battle. He was confronted by a Confederate line of 37,712 troops under the division commanders Generals Breckenridge, Polk and Hardee. Facing them Rosecrans disposed Gen. McCook, right; Gen. Thomas, center; and Gen. Crittenden, left. Bragg attacked at dawn, Dec. 31, a detachment under Gen. Hardee, forcing McCook back with great loss; Gen. Thomas, rallying the Union left, saved it from rout. The day's fighting ended indecisively. Neither side offered battle the next day. On Jan. 2 Bragg renewed the attack, unavailingly, and during the night abandoned his winter quarters. The Union loss was 1,677 killed; the Confederate loss, 1,294.

**MURIATIC ACID**. See HYDROCHLORIC ACID.

**MURILLO, BARTOLOME ESTEBAN** (1617-1682), Spanish painter, was born at Seville in 1617. Murillo is one of the world's great painters and is destined to remain so in spite of the fact that modern students often take a patronizing attitude towards him. This is because his work, excellent enough technically, makes a popular rather than a profound appeal. As we will always have the populace with us, Murillo will always have a following. The great wide-spread public has its necessities that subtle specialists sometimes ignore, and the artist who meets the requirement is of capital importance to the world.

Murillo was a simple, admirable man, the son of a humble artisan of Seville. A distant relative, Juan del Castello, an artist of sorts, gave him instruction when his talent declared itself, and he became an apt pupil. He soon learned how to paint the madonnas and other religious pieces that could be sold at the time of the great religious festivals to the common people, and in that way he made a living. This early direct traffic with customers probably affected his mental habits permanently and led him to think in terms that would meet the popular demand. However, he had an inquiring mind and it was his own ambition that led him to seek to please people with higher tastes. Noticing that one of his fellow-artists had improved after a trip to Italy, Murillo decided to travel also. He got as far as Madrid where Velasquez was kind to him, gave him lodging and procured him access to the royal galleries. He there studied the masterpieces of Ribera, Van Dyck and Velasquez and laid the foundation for the style that was to win him fame. No doubt, his native inclination toward over-sweetness led him to think Van Dyck the most acceptable of these masters.



Giving up his project of voyaging to Italy, he returned to Seville where there was a sister dependent upon him. He soon had a chance to practice all the new ideas that flooded upon him. The friars of the Convent of San Francisco wished to decorate the walls of their cloister in as notable a way as possible, but being short of funds were unable to engage a famous painter. Murillo, being also short of funds, proffered his services which were accepted. The 11 resultant decorations, which included pictures of San Francisco, Santa Clara, San Diego and San Gil, at once made the artist locally famous. The notion that a new great artist had arrived pleased the native pride. The nobles of the city jostled with the humble art students who crowded to see the new pictures; and he received many commissions.

After that Murillo's life was very different. In 1648 he married Doña Beatriz de Cabrera y Sotomayor, a wealthy lady of rank, and embarked upon a most productive career. The bulk of his work consisted of religious pieces, including *Moses Striking the Rock*, *The Return of the Prodigal*, *St. Elizabeth of Hungary*, *Abraham Receiving the Three Angels*, *The Miracle of the Loaves and Fishes*, *St. Peter Released from Prison*, and others, which were executed for the Hospital of Caridad, and which became especially famous. Murillo was one of the first to paint street arabs realistically and his rare portraits are also much admired. The museums in all parts of the world vie for possession of these masterpieces but it is in the Prado at Madrid and in his native city of Seville that Murillo can be best studied. He died at Seville, Apr. 3, 1682. H. McB.

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**MURPHY, JOHN B.** (1857-1916), Chicago surgeon, was born in Appleton, Wisconsin, December 21, 1857. He graduated from Rush Medical College in 1879, and studied in Europe from 1882 to 1884. Doctor Murphy was considered the most effective teacher of surgery in the West, teaching successively at Rush Medical College, the College of Physicians and Surgeons, Chicago, and at Northwestern University Medical School. In 1911 he was president of the American Medical Association. His invention of the button, which bears his name, in intestinal operations simplified abdominal technique. His name is also associated with other procedures in medicine, among which are artificial PNEUMOTHORAX and treatment of peritonitis called the Murphy drip. Murphy achieved remarkable results in bone grafts. His contributions to medical literature were numerous.

**MURPHY, JOHN FRANCIS** (1853-1921), American painter, was born in Oswego, N.Y., Dec. 11, 1853. He was largely self-taught and first exhibited at the National Academy of Design, New York, in 1876. He won many prizes, medals and honors for his landscapes, which are included in most of the prominent collections in America. His *Old Barn* is in the Metropolitan Museum, New York. Murphy became a National Academician in 1887. He died in New York, Jan. 29, 1921.

**MURPHYSBORO**, a city in southwestern Illinois, the county seat of Jackson Co., situated on Big Muddy River, 90 mi. southeast of St. Louis, Mo. Bus lines and three railroads serve the city. Murphysboro is the center of a fruit and grain growing region. Coal, shale and clay deposits are found in the vicinity. The city has potteries, shoe factories and various other industrial plants. Several miles southeast is Giant City State Park, a most interesting rock formation. The site of Murphysboro was selected for a court house in 1843; the city was incorporated in 1863. Gen. John A. Logan was born here. Pop. 1920, 10,703; 1930, 8,182.

**MURRAY, SIR GEORGE JOHN ROBERT** (1863- ), Australian statesman, was born at Murray Park, Magill, South Australia, Sept. 27, 1863. He received his education at Edinburgh, Adelaide, Australia, and at Cambridge. Called to the bar in 1888, he was made King's Counsel in 1906. In 1915 he was appointed vice-chancellor of the University of Adelaide, and chancellor the following year.

**MURRAY, GILBERT** (1866- ), British scholar, whose full name was George Gilbert Aime Murray, was born at Sydney, New South Wales, Jan. 2, 1866. He was educated at St. John's College, Oxford, and became Professor of Greek at Glasgow University, and later at Oxford. He was Professor of Poetry at Harvard University in 1926. Murray published a *History of Ancient Greek Literature* in 1897, and converted many of the plays of EURIPIDES into English verse. His other writings include *The Rise of the Greek Epic*, *The Foreign Policy of Sir Edward Grey*, *Faith, War, and Policy* and *The Classical Tradition in Poetry*.

**MURRAY, SIR JAMES AUGUSTUS HENRY** (1837-1915), British philologist and lexicographer, was born at Denholm, near Hawick, Roxburghshire, Feb. 7, 1837. He studied at the University of Edinburgh and received his B.A. from the University of London. He was engaged in teaching from 1855 to 1885. In 1879 he began his labors for the Philological Society and the Oxford University Press, editing the *New English Dictionary on Historical Principles*, a colossal work of which he lived to finish about one-half. The first volume was printed in 1884. In 1885 he received an honorary M.A. from Balliol College, Oxford. He was a fellow of the British Academy and in 1908 was knighted. He died at Oxford, July 26, 1915.

**MURRAY, JOHN** (1745-93), the first of a family of English publishers, who changed his name from McMurray, was born at Edinburgh, 1745. In 1768 he went to London, dropped the Scottish prefix from his name, and entered the publishing business. He died at London Nov. 6, 1793. His son, the second John Murray, was born in 1778 and in 1803 assumed control of his late father's business. Four years later he was associated in publishing Scott's *Marmion* and in founding the *Edinburgh Review*. In 1811 he published the first two cantos of Byron's *Childe Harold* and published much of Byron's successive works. He died June 27, 1843, leaving the firm to his son, the

third John Murray, who was born in 1808, who published works by Gladstone, Lyell, and Darwin, and wrote for and published *Murray's Magazine*. He also began the "Murray's Handbooks," a famous series of guides for tourists, writing several of them himself. He died April 2, 1892, leaving the publishing house to his two sons, A. H. Hallam Murray and the fourth John, who continued the firm. John Murray, 4th, died Nov. 30, 1928.

**MURRAY, JOHN CLARK** (1836-1917), Canadian educator, was born at Paisley, Scotland, in 1836. He was educated at Glasgow, Edinburgh, Göttingen and Heidelberg. In 1862 Murray became professor of philosophy in Queen's University, Kingston, Canada, and in 1872, at McGill University, Montreal. His published works include: *An Outline of Sir William Hamilton's Philosophy*, 1870; *Ballads and Songs of Scotland*, 1874; *Memoir of David Murray*, 1880, and *An Introduction to Psychology*, 1904. He died Nov. 21, 1917.

**MURRAY, WALTER CHARLES** (1866- ), Canadian educator, was born in Studholm, New Brunswick, May 12, 1866. He was educated at the universities of New Brunswick, Edinburgh and Berlin. Murray was professor of philosophy and economics at the University of New Brunswick in 1891-92, and Munro professor of philosophy and lecturer on education at Dalhousie University, Nova Scotia, 1892-1908. In the latter year he was appointed president of the University of Saskatchewan. His educational writings include *Public Studies in Mind Growth*.

**MURRAY**, the most important river of Australia, having a length of 1,500 mi. and draining an area of 300,000 sq. mi. With its affluent, the DARLING, it comprises the Murray-Darling system, "the Nile of Australia." Formed by the junction of several streams near Mt. Kosciusko in the Australian Alps, the river flows in a northwesterly course to form the boundary between New South Wales and Victoria until just after the town of Renmark is reached, after which it flows wholly across South Australia. The Murray is usually open to navigation for seven months of the year. Its chief port is Albury, 100 mi. from its source, and the farthest point accessible to steamers under favorable conditions. Echuca and Corowa are also important river towns. Leading tributaries, other than the Darling, are the Murrumbidgee and the Lachlan. The mouth of the stream is obstructed by sand bars as it empties into the Indian Ocean through Encounter Bay, 39 mi. southeast of Adelaide. The waterway occasionally winds through countryside dotted with lakes and lagoons, but for the most part traverses dreary, waterless plains.

**MURRAY**, a city situated 7 mi. south of Salt Lake City, Utah, in Salt Lake Co. It is served by three railroads and has automobile curtain and broom factories. The region is noted for its fine fruit. Pop. 1920, 4,584; 1930, 5,172.

**MURRAY COD**, a large, fresh-water fish (*Oligororus macquariensis*) of the SEA BASS family (*Serranidae*), abundant in the Murray River and its tribu-

taries in Australia. It is perchlike in the form of the head and body and possesses a dorsal fin with both spinous and rayed portions; it is said to attain a length of 3 ft. and a weight of 120 lbs. Though varying in color it is generally brownish tinged and spotted with green. The Murray cod is celebrated for its excellent flavor; within its range it is the foremost food fish.

**MURRE**, a genus (*Uria*) of web-footed maritime birds very closely allied to the auks and guillemots, found in northern regions. They are of medium size and stocky build, with narrow bills and plumage which is nearly black above and snow-white below. Murres live largely on the open sea, feeding upon fish, crustaceans and other aquatic life, and breed in vast crowded communities in rocky situations mostly in the arctic. Their eggs, which vary greatly in color, were considered an article of commerce before the passage of the Migratory Bird Treaty between Canada and the United States.

The common murre (*U. troille*) occurs in the north Atlantic wintering southward to Maine and the Mediterranean. Its western representative, the California murre (*U. t. californica*), found on the Pacific coast southward to California, formerly bred in great numbers on the Farallone islands, whence, during the last half of the 19th century, millions of eggs were taken to the San Francisco markets. Brünnich's murre (*U. lomvia*), of the north Atlantic and arctic, sometimes ranges southward to the middle states in winter.

**MURZSTEG PROGRAM**, a program for reform in Macedonia which grew out of a discussion between the Emperor Francis Joseph of Austria-Hungary and Tsar Nicholas of Russia and their Foreign Ministers at Murzsteg in 1903. There had been a rebellion in Macedonia against Turkish misrule, which the Turks had suppressed with more than usual brutality. Lansdowne, the British Foreign Secretary, proposed the adoption of strong measures, and it was partly on the basis of his suggestion that the Murzsteg program was drawn up.

It provided for the appointment of civil agents of Austria and Russia to supervise the introduction of reforms in Macedonia; of a foreign general and officers to train the gendarmerie; the reorganization of the department of justice to which Christians were henceforth to be admitted; a mixed commission, consisting of an equal number of Christians and Mohammedans to investigate the crimes committed in the rebellion; the remission of a year's taxes to Christians in the burned villages, and the disbanding of the irregular troops. These reforms together with those of the program of the previous February were to be introduced without delay. Turkey was very slow in carrying out the agreement, secretly resisting, so that, by 1905, nothing had been accomplished save the reorganization of the gendarmerie.

**MUSCA** (gen. *Muscae*), the fly, a small constellation immediately south of the Southern Cross, comprising chiefly four stars of the third and fourth magnitude. See STAR: map.

**MUSCATINE**, a city in eastern Iowa, the county seat of Muscatine Co., situated about 40 mi. north of Burlington, on the big bend of the Mississippi River. Bus lines, river craft and four railroads serve the city, and there is an airport. Grain, garden crops, and livestock are raised in the vicinity. The manufacture of pearl buttons, at first made from the mussel shells found on the river bank, dates from the latter part of the 19th century and is of prime importance. Many varieties of condiments, lumber products and canning machinery are included in the manufactures. In 1929 the factory output reached approximately \$13,000,000; the retail trade amounted to \$11,281,265. Muscatine was settled in 1833, and incorporated as the town of Bloomington in 1839. It was chartered as the city of Muscatine in 1851. Wild Cat Den, a state park a few miles north of here, has beautiful cliffs and a gorge inhabited by wild animals. Pop. 1920, 16,068; 1930, 16,778.

**MUSCLE READING**, the art of finding objects, including numbers and letters, by skillful detection of the slight and involuntary movement of the subject. The usual method is for the reader, who may even be blindfolded, to place his hand on the forehead or arm of the person who knows the hiding place. By testing the readiness with which the subject follows or resists a lead, he determines the general, then the more special location, even to a page of a book or a passage on the page.

Training perfects the technique. Even performing animals are keen to detect slight signs on the part of their trainers, which fact lies at the basis of the performances of so-called educated animals. Experiments show that intense thinking of an object induces involuntary movements in that direction; even involuntary whispering has been shown to be the clue to alleged MIND READING.

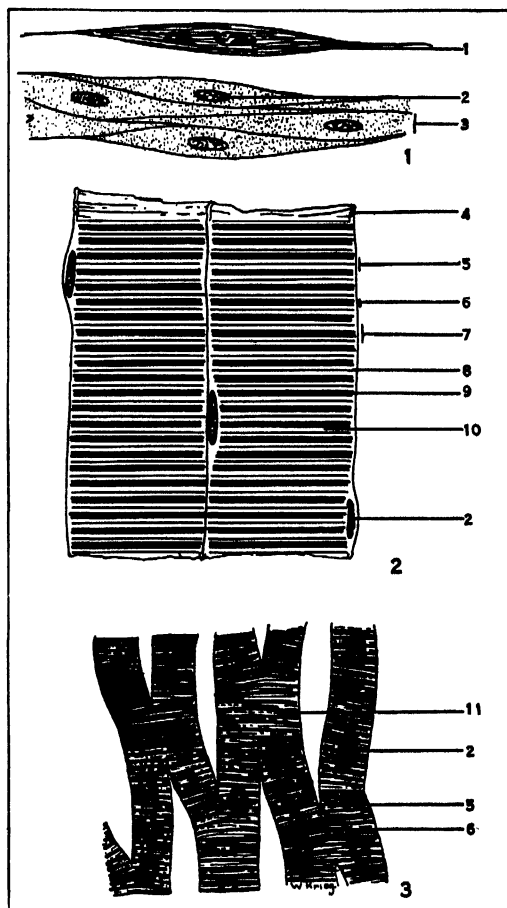
**MUSCLES**, that portion of the bodily structure of an animal having the property and function of contraction, by virtue of the position and attachment of which, the animal is enabled to change the size, form, or position of an organ, or to move itself from place to place.

In adaptation to its contractility, muscular tissue is composed of long strands which have a composition enabling them to shorten their long axis. Muscle never acts by active expansion. There are three kinds of muscle; smooth, cardiac, and striated, which have different situations and different modes of action.

*Smooth muscle* is found in the walls of the digestive canal, of the air-passages, of most of the ducts of the urogenital system, of blood vessels, especially of arteries, and attached to the hairs. Its action is relatively slow, but each contraction endures a relatively long time. It is composed of very long, spindle-shaped cells arranged parallel to one another and generally forming continuous sheets. In most situations, particularly in the walls of the digestive tract, smooth muscle forms two layers; circular and longitudinal (Fig. 1).

*Striated muscle* constitutes probably the greatest

bulk of any variety of tissue in the body and forms the voluntary muscles. Its contractions are rapid and of short duration. In fact, a muscle is enabled to remain in a state of contraction by various of its fibres contracting intermittently. It is composed of very long but minute tubes filled with contractile fibrils (Fig. 2, *Fib.*). The wall of the tube is termed a sarcolemma (*Sl.*), and the matrix suspending the



FIGS. 1-3. MINUTE STRUCTURE OF MUSCLES  
FIG. 1, SMOOTH MUSCLE; FIG. 2, SKELETAL MUSCLE; FIG. 3, CARDIAC MUSCLE

1 Fl., fibril; 2 N., nucleus; 3 Fib., fiber; 4 Sl., sarcolemma; 5 L.B., light band; 6 D.B., dark band; 7 Sm., sarcomere; 8 K.L., Krause's line; 9 H.L., Hensen's line; 10 Sp., sarcoplasm; 11 I.D., intercalary disc

fibrils is the sarcoplasm (*Sp.*). Each of these fibrils is marked by alternate dark and light bands, so arranged within the sarcolemma that corresponding bands of all the fibril are contiguous. Thus a series of dark and light striations is seen within each sarcolemma or muscle fiber. In spite of considerable investigation the nature of contraction is unknown.

The measurable characteristics of muscular action have, however, been studied very thoroughly. When a muscle is caused repeatedly to contract, it attains a

## MUSCLES

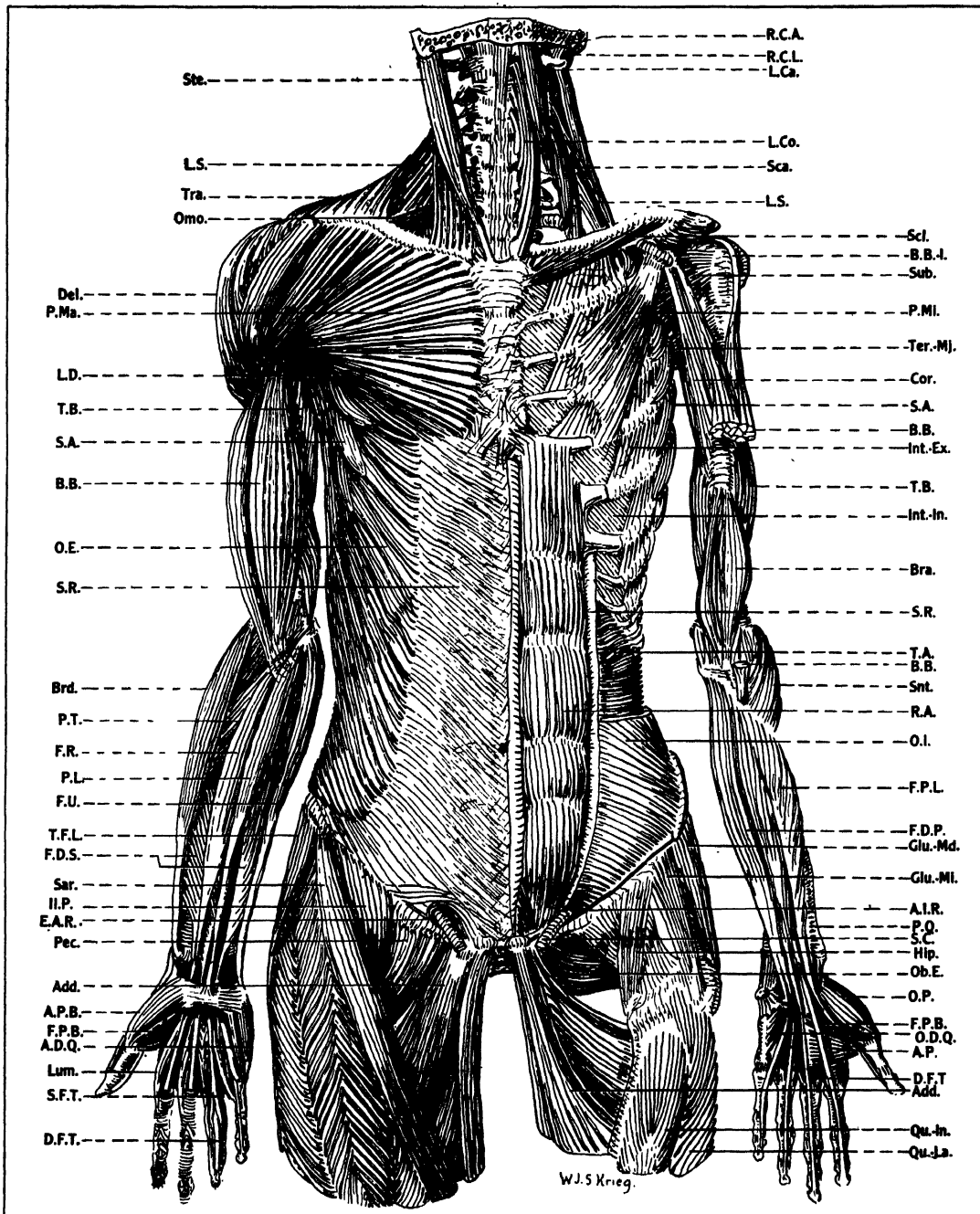


FIG. 4. MUSCLES OF THE HUMAN TRUNK AND UPPER EXTREMITY, VIEWED FROM THE FRONT

The superficial muscles are indicated on the right side, while the deep ones are shown on the left. A.D.Q., abductor digiti quinti; Add., adductors; A.I.R., internal abdominal ring; Anc., anconaeus; A.P., adductor pollicis; A.P.B., abductor pollicis brevis; A.P.L., abductor pollicis longus; Aur.-Po., auricularis posterior; B.B., biceps brachii; B.B.-I., long head of biceps; B.F., biceps femoris; Bra., brachialis; Brd., brachioradialis; Buc., buccinator; Can., caninus; Cor., coracobrachialis; Del., deltoides; D.F.T., deep flexor tendon; E.A.R., external abdominal ring; E.C.R., extensor carpi radialis; E.C.U., extensor carpi ulnaris; E.D.C., extensor digitorum communis; E.P.B., extensor pollicis brevis; Epi.-Ap., epicranial aponeurosis; Epi.-Fr., frontalis; Epi.-Oc., occipitalis; E.P.L., extensor pollicis longus; E.Q.P., extensor digiti quinti proprius; F.D.B., flexor pollicis brevis; F.D.P., flexor digitorum profundus; F.D.S., flexor digitorum sublimis; F.H.B., flexor hallucis brevis; F.P.B., flexor pollicis brevis; F.P.L., flexor pollicis longus; F.Q.B., flexor digiti quinti brevis; F.R., flexor carpi radialis; F.U., flexor carpi ulnaris; Glu.-Md., gluteus medius; Glu.-Mi., gluteus minimus; Glu.-Mj., gluteus major maximus; Hgl., hyoglossus; Hip., sartorius; I.D., dorsal interossei; I.I.P., iliocaps-psoas; Int.-Ex., external

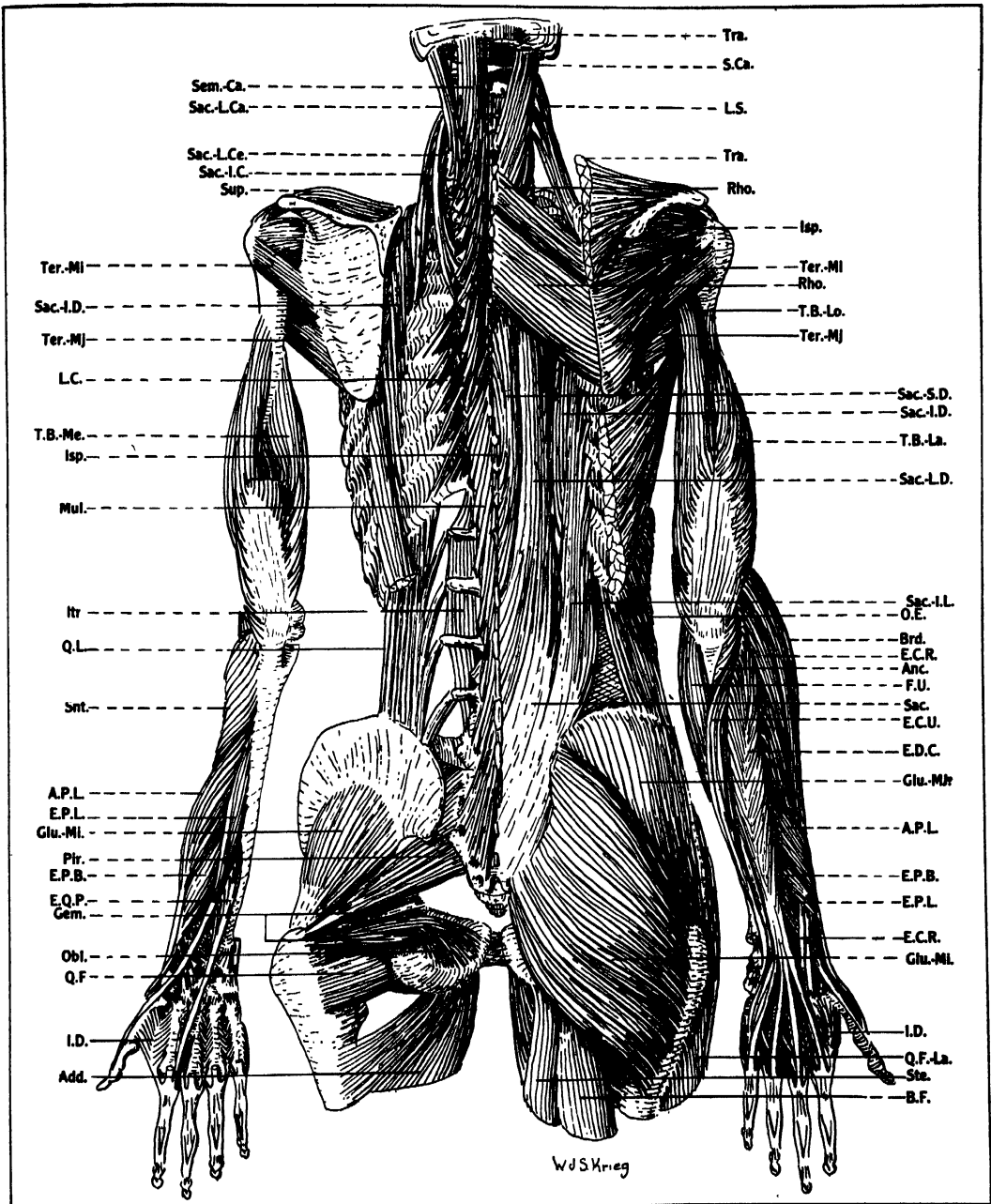


FIG. 5. MUSCLES OF THE HUMAN SYSTEM AS SEEN FROM THE REAR

intercostals; Int. In., internal intercostals; Isp., interspinales; Itr., intertransversarii; L.C., levatores costarum; L.Ca., longus capitis; L.Co., longus colli; L.D., latissimus dorsi; L.S., levator scapulae; Lum., lumbriales; Men., mentalis; Mul., multifidus; Nas., nasalis; Ob.E., obturator externus; Ob.I., obturator internus; O.D.Q., opponens digiti quinti; O.E., obliquus externus; O.I., obliquus internus; Omo., omo-hyoideus; O.P., opponens pollicis; Pec., pectineus; P.L., palmaris longus; P.Ma., pectoralis major; P.Mi., pectoralis minor; P.Q., pronator quadratus; Pro., procerus; P.T., pronator teres; Q.F., quadratus femoris; Q.F.-La., quadratus femoris lateralis; Q.L., quadratus lumborum; Q.La., vastus lateralis; R.A., rectus abdominis; R.C.A., rectus capitis anterior; R.C.L., rectus capitis lateralis; Rho., rhomboides; S.A., serratus anterior; Sac., sacrospinalis; Sac.-I.C., iliocostalis cervicis; Sac.-I.D., iliocostalis dorsi; Sac.-I.L., longissimus capitis; Sac.-L.Ce., longissimus cervicis; Sac.-L.D., longissimus dorsi; Sac.-S.D., spinalis dorsi; Sar., sartorius; S.Ca., longissimus capitis; S.Ce., longissimus cervicis; Sca. (A.M.P.), scaleni anterior, medius, posterior; Scl., subclavius; Sem.-Ca., septimus; S.F.T., superficial flexor tendon; Snt., supinator; S.R., sheath of rectus; S.S.L., sacrospinous ligament; Ste., sternocleidomastoideus; S.T.L., sacrotuberous ligament; Sub., subscapularis; T.A., tendon of Achilles; T.B., triceps brachii; T.B.-La., triceps brachii lateralis; Ter.-Mi., teres minor, major; T.F.L., tensor fasciae latae; Tra., Trapezii; Tri., triangularis; Zyg., zygomaticus

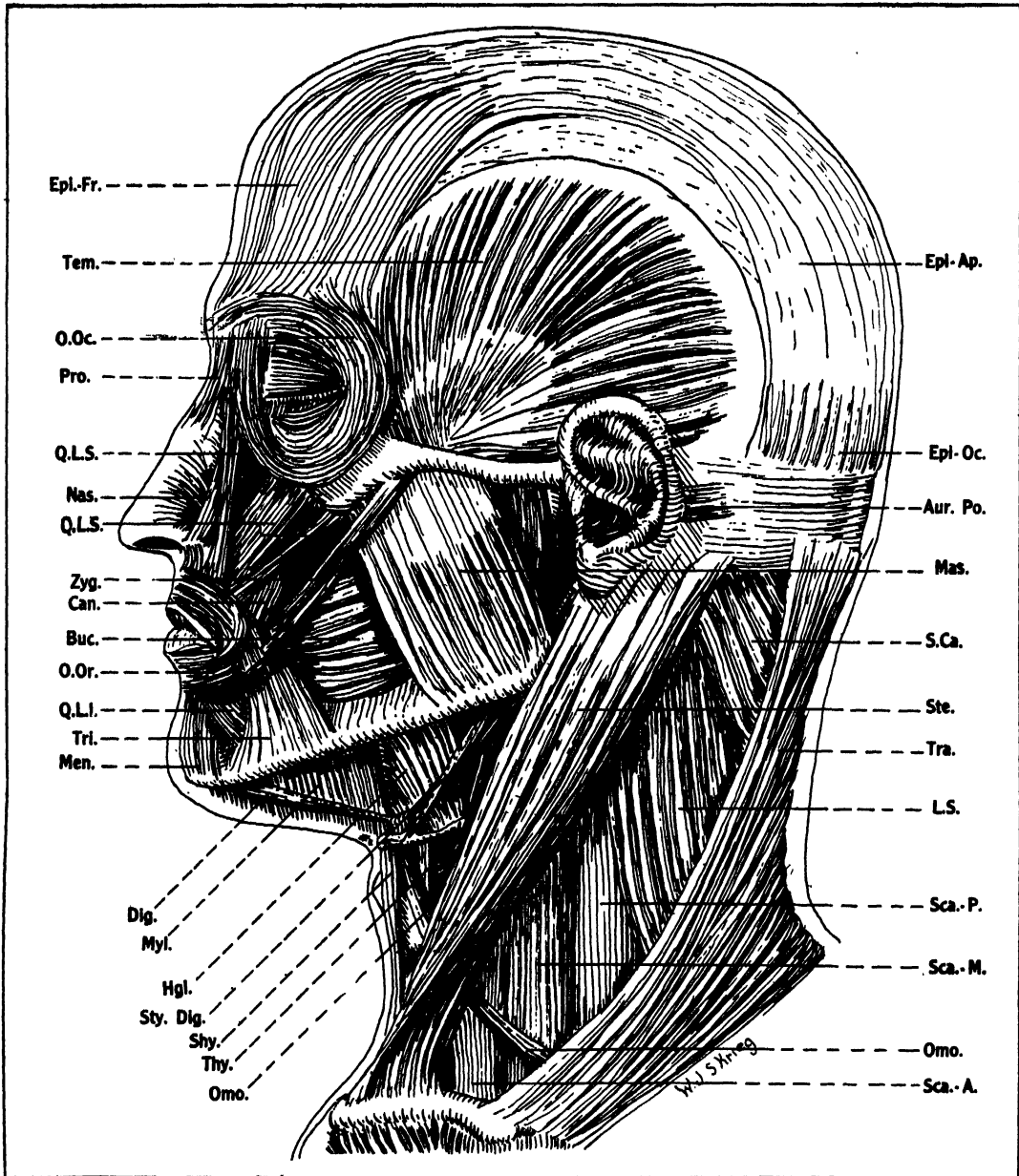


FIG. 6. MUSCLES OF THE HEAD AND NECK

Aur. Po., auricularis posterior; Buc., buccinator; Can., caninus; Dig., digastricus; Epl. Ap., epicranial aponeurosis; Epl. Fr., frontalis; Epl. Oc., occipitalis; Hgl., hyoglossus; L.S., levator scapulae; Mas., masseter; Men., mentalis; Myl., mylohyoides; Nas., nasalis; Omo., omo-hyoides; O.Oc., orbicularis oculi; O.Or., orbicularis oris; Pro., procerus; Q.L.I., quadratus labii inferioris; Q.L.S., quadratus labii superioris; Sca. A., M., P., scaleni anterior, medius, posterior; S. Ca., splenius capitis; Ste., sternocleidomastoideus; Sty. Dig., stylohyoides digastricus; Shy., sternohyoides; Tem., temporalis; Thy., thyrohyoides; Tra., trapezius; Tri., triangularis; Zyg., zygomaticus

state of **FATIGUE**, due to the accumulation of wastes, chiefly lactic acid. In this state, its contractions are by no means as efficient as when rested, and the muscle itself is in a state of prolonged contraction, or contracture. After a contracting stimulus reaches a muscle, there is a latent period less than  $1/100$ th

second before contraction. The duration of contraction is from  $1/4$ th of a second to one second. When the frequency of stimuli to a muscle reaches the order of 30 per second, the muscle is thrown into a steady, intense contraction, termed tetany.

*Cardiac muscle*, the third variety, is in general in-

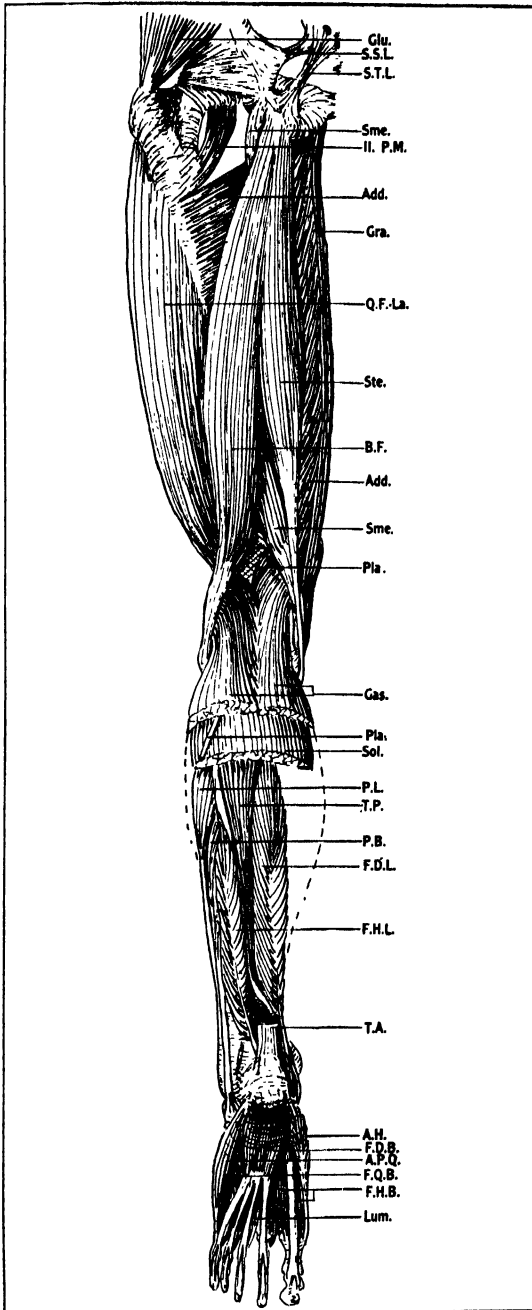


FIG. 7. MUSCLES OF THE LOWER EXTREMITY

Add., adductores (3); A.H., abductor hallucis; A.P.Q., abductor digiti quinti; B.F., biceps femoris; F.D.B., flexor digitorum brevis; F.D.L., flexor digitorum longus; F.H.L., flexor hallucis longus; F.Q.B., flexor digiti quinti brevis; Gas., gastrocnemius; Glu., gluteus; Gra., gracilis; Il. P.M., iliopsoas; Lum., lumbricales; P.B., peroneus brevis; P.L., peroneus longus; Pla., plantaris; Q.F.La., vastus lateralis; Sme., semimembranosus; Sol., soleus; S.S.L., sacrospinous ligament; Ste., semitendinosus; S.T.L., sacrotuberous ligament; T.A., tendon of Achilles; T.P., tibialis posterior

intermediate in its characteristics between the two other types. It is composed of striated fibers which, however, branch and intercommunicate freely. It is found only in the walls of the heart. (Fig. 3.)

**Muscular System.** The muscles of the human body are derived from blocks of cells arranged serially on either side of the developing spinal cord in the early embryo. These masses, called myotomes, retain their serial arrangement in fishes; but in higher animals they form specialized muscles by migration, union and splitting. Most human muscles have similar origin as corresponding muscles in other vertebrate groups.

Muscles are able to move portions of the body by virtue of their property of contraction. This contractile power is translated into useful work by a system of levers of which the muscles form the power arm and the bones the rigid bar. The less movable attachment of a muscle is the origin, the more movable one being termed the insertion. Information on these two points, together with some knowledge of the arrangement of the skeleton, enables one to determine the action of a muscle.

The accompanying illustrations show the most important muscles in the body, giving the names and the location of each.

W. J. S. K.

**MUSCLE SHOALS**, a 37-mile stretch in the Tennessee River, above the city of Florence, in northwestern Alabama, in the course of which the stream drops 132 feet. A lock canal permits navigation around the series of rapids and pools which are encountered throughout the length of the section. The name was probably bestowed on the region by early settlers forced to employ extreme muscular efforts to paddle their canoes upstream. The extraordinary drop of the water, the excessive water supply in the district, including an average annual rainfall of 45 in., and the obstructions to navigation on the Tennessee between Florence and Decatur, are factors which have made Muscle Shoals the subject of engineering study since the administration of Washington. The first concern of the government was to circumvent the rapids, and between 1828 and 1889 a series of surveys were made, leading in 1890 to the construction of a lock canal. In 1907 new surveys were undertaken to determine the water-power potentialities in the region. By the Federal Defence Act of 1916 the government obtained title to a site on the river where in 1918 army engineers began construction of Wilson Dam. This masonry structure, completed in 1926, at a cost of \$51,000,000, is 4267 ft. in length, 142 ft. high, and is flanked by two locks, with a maximum lift of 45½ ft. The spillway section is punctured by 58 arched openings fitted with steel gates, capable of discharging 1,000,000 cu. ft. of water per second. A power plant was constructed on the south bank, capable of producing ultimately 600,000 horse-power. The four units completed in 1925 each furnished 30,000 horse-power. The immediate function for which the development was planned was the manufacture of nitrate for explosives needed in the World War. One nitrate

plant was in operation just before the close of the War. In 1921 the government determined to complete the project for the two purposes of producing water-power and nitrates for fertilizer. Two additional dams, above and below the Wilson Dam, and two nitrate plants brought the total construction cost, in 1930, to about \$150,000,000. When the entire project is completed it will provide 3,000,000 hydro-electric horse-power, available in seven states. Since 1925, when Henry Ford's offer to purchase the plant was declined, Muscle Shoals has been the subject of controversy in Congress.

**MUSCOVITE**, or common white mica, is a rock-forming mineral found in igneous rocks and pegmatites. Its perfect cleavage into transparent sheets makes it useful in manufacturing stove windows, lamp chimneys and for other purposes. *See also* Mica.

**MUSES**, in classical mythology, the goddesses who inspired song, poetry, arts and sciences, were the nine daughters of Zeus and Mnemosyne. They were born at the foot of Mt. Olympus, in Pieria. One of their haunts was at Mt. Helicon near the sacred fountains of Aganippe and Hippocrene, and Mt. Parnassus and the Castalian spring were also sacred to them. The muses were: CLIO, muse of history, represented with open scroll or books; EUTERPE, muse of lyric poetry, with flute; THALIA, muse of comedy, with comic mask and shepherd's staff; MELPOMENE, muse of tragedy, with tragic mask and club or sword and wearing the cothurnus; TERPSICHORE, muse of choral dance and song, with lyre and plectrum; ERATO, muse of erotic poetry and mimicry; POLYHYMNIA or Polymnia, muse of the hymn; URANIA, muse of astronomy, with pointer and globe; CALLIOPE or Calliopea, muse of epic poetry, with tablet and stylus.

**MUSEUM OF MODERN ART, THE**, a museum located in New York City, established in 1929 "to bring about a sound and widespread understanding of modern art by impartial presentation, to raise the level of art appreciation throughout America, to encourage living artists by exhibiting their work, and to promote international understanding through art." Since the date of its founding, the museum has given almost a score of exhibitions of modern American and foreign art. It has aimed to further the growth of art knowledge and appreciation by organizing and sponsoring loan exhibitions which travel throughout the United States, by giving lectures, publishing catalogues and books, and by circulating reproductions of masterpieces of modern art. The museum, besides being maintained to give representation to international art and architecture, is also established for the purpose of developing the application of modern art to practical life.

A. C. G.

**MUSEUMS, ART**, collections of art exhibited in buildings open, with few exceptions, to the public. The early art collections were made by royal families and wealthy individuals to adorn their palaces or homes, and were rarely seen by any considerable number of people. Fortunately many of these earlier collections were later transferred to public museums in

part or in whole. Indeed they frequently formed the nucleus of these later collections, as for example the collections of Cosimo de' Medici, out of which grew the world renowned Uffizi Palace at Florence, Italy.

The art museum as it is known to-day dates back to the 17th century and was an outgrowth of the Renaissance. Great Britain was the first country to establish a public museum; the British Museum was opened in 1753. France in 1789 opened the Louvre to the public, and six years later the Pennsylvania Academy of Fine Arts was opened. It was not, however, until the 19th century that there was any marked growth in art museums.

Art museums to-day are taking an active part in the educational as well as the cultural life. Lectures are given, and teachers may bring classes to the museums to study the collections and receive special instruction. In addition, museums are supplying schools with motion pictures and lantern slides to accompany specially prepared lectures. Some of the museums, as the Art Institute of Chicago, are conducting art schools.

**The United States.** There are several art museums in the United States which rank with the greatest museums of the world. The METROPOLITAN MUSEUM OF ART, New York City, is the finest art museum in America. Egyptian, Babylonian, Assyrian, Phoenician, Etruscan, Greek and Roman antiquities are outstanding in the many valuable collections. In paintings, the Italian, Spanish, German, Dutch, Flemish, French, English and American schools are well represented. The exhibit of American decorative arts of colonial days is another important feature. The MUSEUM OF FINE ARTS, in Boston, ranks next in importance. Its collection of classical art is considered the foremost in America, and its group of Oriental art, dating back to the 5th century, the finest in the world. The Pennsylvania Academy of Fine Arts, Philadelphia, Pa., is not only the oldest museum in America but also one of the outstanding world museums. Though the important schools and periods in art are well represented, chief emphasis has been given the collection of American paintings. It has also a notable and large exhibit of old prints. The Art Institute of Chicago, an art school and museum, has a noteworthy collection of paintings of old masters; it has the largest collection of paintings of Inness in America. The museum also has many original marbles and bronzes, Egyptian and classical antiquities, about 1000 casts of sculpture of all periods and a fine group of engravings, etchings and lithographs by Rembrandt, Whistler, Meryon and other masters.

In the CORCORAN GALLERY OF ART, Washington, there are many original marbles and Barye bronzes, a fine collection of casts of antique, Renaissance and modern sculpture, and paintings of old masters. Notable collections of paintings by European masters and contemporary American and French artists are to be found in the National Gallery of Art. A very fine exhibit of early Chinese bronzes, jades, and paintings, Japanese and Persian paintings and pottery and



Korean pottery, and a small but notable group of American paintings are in the Freer Gallery of Art, a branch of the National Gallery. The Fogg Art Museum, of Harvard University, Cambridge, Mass., has original pieces of ancient Egyptian and Greek sculpture, approximately 200 paintings of the early Byzantine, Italian, Flemish, French and other schools, and paintings and drawings by old masters.

Originals and casts of Greek and Roman antiquity, Greek terra cottas, Oriental and European ceramics, modern sculpture and paintings of old masters and modern artists are among the notable collections in the Brooklyn Institute of Arts and Sciences, Brooklyn, N.Y. The originals and casts of the Cincinnati Museum Association cover the history of art from the days of the Egyptians and Greeks to the present. The large groups of ceramics, gems and intaglios from classical to modern times, and the paintings by old masters are also noteworthy. All of the arts of the important periods and countries are included in the fine collections in the Cleveland Museum of Art. Period rooms as well as paintings and sculpture of the Gothic, Renaissance and modern schools of the 17th and 18th centuries are featured in the Pennsylvania Museum of Art, Philadelphia.

Among other important art museums in America are the Los Angeles Museum of History, Science and Art, which has a fine group of paintings by well-known American artists and contemporary French artists, with a special gallery of American water colors; and the HUNTINGTON LIBRARY AND ART GALLERY, San Marino, Cal., rich in Italian and Flemish paintings of the 15th and 16th centuries, portraits and landscapes of the 18th century, French tapestries and Italian and French bronzes. The Public Museum of the City of Milwaukee, Wis., is noted for its extensive collection of Indian copper implements. The Museum of the University of Pennsylvania has a fine group of decorative arts of Egypt, Babylonia, Palestine, Greece and Rome. The St. Louis City Art Museum has representative collections of paintings, sculpture, bronzes, silver of the 15th and 16th centuries, Persian tiles of the 16th and 17th centuries, tapestries and Oriental rugs. A noteworthy collection of Persian and Chinese ceramics, Chinese bronzes, paintings by old masters and contemporary artists, and original marbles and casts are found in the Detroit Institute of Arts.

The Pittsburgh Fine Arts Museum is rich in paintings by modern artists, as are also the WHITNEY MUSEUM OF AMERICAN ART and the MUSEUM OF MODERN ART, both located in New York City. The Buffalo Fine Arts Academy emphasizes the modern oil paintings by American and foreign artists. Mention should be made of the Museum of the American Indian, New York City, and the Hispanic Society of America, also in New York City, which has exhibits of the arts of the Spanish countries; the Toledo Museum of Art, which has noteworthy exhibits of paintings, ceramics, sculpture and ancient glass, and the Baltimore Museum of Art which has a permanent exhibit of Cypriote antiquities, paintings and bronzes

and a loan exhibit of modern painting and sculpture by American and other artists.

**Great Britain.** In London alone there are several world renowned art museums. The BRITISH MUSEUM has a large and notable collection of Greek and Roman marbles, Egyptian and Assyrian antiquities, greatly enlarged by the recent discoveries of Ur, and an exhibit of Chinese paintings unequalled in Europe. The Egyptian collection is rivaled only by that at Cairo. In the NATIONAL GALLERY there are a large number of masterpieces from the Dutch school, unequalled except by the collection in Holland, from the Italian school rivaled only by the collections in Italy, and smaller collections from other schools. The exhibit of English paintings in number and quality excel any other in the world. The TATE GALLERY and National Portrait Gallery should also be mentioned. The VICTORIA AND ALBERT MUSEUM, South Kensington, has noteworthy collections of ceramics, paintings by old masters and sculpture. In addition to the paintings by 18th century masters, which are unrivaled by any collection except at the Louvre, the Wallace Collection has paintings by the old masters of the Italian, English, Flemish, Dutch and Spanish schools.

Famous paintings and drawings by pre-Raphaelites and Chinese porcelain of the Ming, K'ang Hsi, Yung Cheng and Ch'ien Lung periods are included in the collections of the Birmingham Museum and Art Gallery. Pre-Raphaelite and European paintings of the 13th to the 16th centuries are well represented in the Walker Art Gallery, Liverpool. The Manchester Art Gallery has a large group of paintings of the English school, especially of the 19th century, and a notable exhibit of water colors by Turner, Chinese porcelain from the Ming dynasty through the 18th century and English pottery dating from the earliest times to the beginning of the 19th century. The Bristol Museum and Art Gallery has noteworthy exhibits of oil paintings, water colors and etchings; and the Leeds City Art Gallery in addition to paintings by Gainsborough, Leighton, Holman Hunt, Sir Joshua Reynolds and other masters, has an outstanding exhibit of Leeds pottery with the original molds used in its manufacture.

In Scotland there are the Glasgow Art Gallery and Museum, rich in paintings by Dutch, Flemish, early Venetian and Italian masters; and the National Gallery of Scotland, in Edinburgh, with paintings by Van Dyck, Rembrandt, Hals and other masters. Also in Edinburgh, are the Royal Scottish Museum, with fine groups of ceramics, silver plate and historical pieces from ancient Egypt; and the National Museum of Antiquities, with a large collection of antiquities of Scotland from the Stone, Bronze and Iron ages. The National Museum of Wales, at Cardiff, has a fine group of sculpture by Welsh artists, and the National Museum of Ireland, at Dublin, prehistoric gold objects and representative collections of Chinese, Japanese, Indian and Persian art.

**European and Other Countries.** Outstanding among the art museums of the world is the Louvre

in Paris. Here there are many masterpieces collected by the French kings and priceless works of art procured through the excavations in Egypt, Mesopotamia and Persia. The LUXEMBOURG is noted for its unrivaled collection of contemporary paintings and sculpture, and the Rodin Museum for the statues and other works of this sculptor. Mention should be made also of the Carnavalet Museum, the Cluny Museum and Trocadero Museum, these all being in Paris, and the St. Germain Museum, just outside the city, which has important exhibits of national antiquities.

Italy has several famous museums, the outstanding one being the Vatican which has a large collection of sculpture and of art of the 15th and 16th centuries. The Terme Museum has an unrivaled collection of ancient bronze. Other notable museums in Italy are the UFFIZI GALLERY, celebrated for its Italian paintings; the PITTI PALACE, for its paintings by Florentine, Venetian and Flemish artists; and the Bargello Museum, for its medieval art, these all being in Florence.

The Kaiser Friedrich Museum, Berlin, has valuable antiquities from Assyria, Babylon, Phoenicia and Syria, while the National Galerie is noted for its paintings from the late 18th century to the present day. Mention should be made too of the Schloss Museum, with representative work from the German, French and Roman schools; the Zwinger picture gallery; and the Dresden Art Museum, famous for its 15th and 16th century art.

Museums in Russia are taking an active part in the modern culture movement. An unrivaled collection of Scythian arts is now housed in the Hermitage Palace, Leningrad, the most important museum in Russia. In Moscow, the outstanding museum is the State Tretyakov Gallery. Holland has the Ryks Museum, Amsterdam, famous for its Dutch and Flemish paintings; and Belgium has the Royal Museum of Fine Arts, at Brussels, noted for its masterpieces by French, Flemish and Dutch painters.

The National Museum and Acropolis Museum, both in Athens, have priceless pieces of Greek sculpture from the Acropolis and bronze statues from Marathon and Cerigotto. In Constantinople, Turkey, another valuable collection of Greek antiquities is housed in the old seraglio, now used as a museum. Here, too, are the Greek sarcophagi found at Sidon. The Museum of Egyptian Antiquities, at Cairo, Egypt, has except in the historical papyri the most valuable collection of Egyptian antiquities in existence. Probably the most extensive of the national museums are the Imperial Museums at Peking.

The most important museums of other countries are: Switzerland, the Swiss National Museum, at Zurich; in Denmark, the National Museum at Copenhagen; in Spain, the PRADO MUSEUM, at Madrid; and in Japan, the Nara Imperial Household Museum, at Nara Park.

M. R.

See P. M. Rea, "Directory of American Museums of Art, History and Science," in Buffalo Society of Natural Sciences Bulletin, Vol. 10; E. E. Lowe, *Report on American Museum Work*; Sir Frederick Kenyon, *Libraries and Museums*, 1930.

**MUSEUMS, SCIENCE**, were a natural outgrowth of the early collections made by individual scientists for their own research studies. As early as the 16th century valuable collections in natural history had been made, but it was not until 1679 that a science museum, the Ashmolean Museum of the University of Oxford, was opened. In 1753 the BRITISH MUSEUM was established, and in 1812 the Academy of Natural Sciences in Philadelphia. America has been particularly prominent in its number of science museums of first rank, for its many scientific expeditions and for the educational work carried on by the museums. In recent years Great Britain has been stressing the educational importance of her museums.

**The United States.** The AMERICAN MUSEUM OF NATURAL HISTORY, in New York City, the largest museum in America, has an unparalleled collection of mammals, unequaled examples of big game of Asia which is rapidly disappearing, life size ethnological groups, mounted skeletons of mammals, reptiles and amphibians, a large species of dinosaurs and valuable geological collections. Of first rank, too, is the United States National Museum, at Washington, which is under the jurisdiction of the SMITHSONIAN INSTITUTION. It has several million specimens in natural history, the most extensive deep water zoological collection from the Atlantic and Pacific oceans in existence, the best collection of firearms in the United States and one of the finest exhibits of historical aircraft in the world, including Lindbergh's *Spirit of St. Louis* and Hawk's *Texaco Eaglet*.

The FIELD MUSEUM OF NATURAL HISTORY, in Chicago, is one of the outstanding museums of the world. It has many thousands of ethnological and archaeological specimens from America, Africa, ancient Egypt and other countries, the largest collection of meteorites in the world, botany collections unrivaled by any other in the United States, one of the most valuable collections of gems and gem minerals in the world, and an important exhibit of birds from East Africa. Of equal rank is the Pittsburgh Museum of Carnegie Institute. Its entomological collection is one of the largest in North America, and its collection of mounted skeletons is notable. The Academy of Natural Sciences, in Philadelphia, is noted for its group of mollusks, its large herbarium of old world plants, its outstanding collection of shells, its eocene and pliocene fossils, and its collection from Peary's relief expedition from Greenland. The Philadelphia Museum, sometimes called the Philadelphia Commercial Museum, has in addition to its representative collection of world commercial and industrial products, a large geographic exhibition gathered from Africa, China, Japan and the Philippines. A collection from the Lewis and Clark Expedition is found in the Peabody Museum of Archaeology and Ethnology, in Cambridge, Mass., noted for its representative geological, botanical, zoological, anthropological and ethnological exhibits from the whole world. The Peabody Museum of Natural History, of Yale University, New Haven, Conn., has a valuable collection of fossil vertebrates, habitat groups

of lower vertebrates, dinosaur groups, and one of the largest exhibits of meteorites in the United States.

The Boston Society of Natural History is famous for its collection of birds and its botanical, geological, paleontological and zoological groups. The Buffalo Society of Natural Sciences is noted for its large number of representative mineralogical, geological, zoological, botanical and ethnological specimens. Mention should be made of the Museum of the American Indian, New York City; the Brooklyn Institute of Arts and Sciences, and its Children's Museum; the Park Museum, Providence, R.I.; the Cincinnati Society of Natural History; the Cleveland Museum of Natural History; the California Academy of Sciences, San Francisco; and the Southwest Museum of Los Angeles. Several of the universities maintain very fine science museums, some of the most outstanding being the museums of the University of Pennsylvania, the University of Michigan and the University of California.

The outstanding technical museum in America, planned after the Deutsche Museum at Munich, is the Museum of Science and Industry, in Chicago. Over 60,000 exhibits, ranging from a full sized locomotive and a section of a coal mine down to microscopic objects are shown, as well as numerous exhibits tracing civilizations from ancient Greece to the present day. Similar in scope but on a smaller scale is the Museum of Science and Industry in New York City. An unrivaled collection of Americana is exhibited at the Edison Institute of Technology, in Dearborn, Mich., a museum and school founded by Henry Ford.

**Great Britain.** The British Museum, London, is as important in the field of science as it is in art. Its natural history collection is one of the largest in the world and is housed in the Natural History Museum, at South Kensington, a branch of the British Museum. The Royal Botanical Gardens at Kew has an extensive and important botanical collection and an unrivaled arboretum. Important zoological and natural history collections are housed in the Liverpool Museum. The Royal Scottish Museum, at Edinburgh, has an important natural history collection.

**European Countries.** The most important science museum in France is the Museum d'Histoire Naturelle, in Paris. Its archaeological collection is particularly noteworthy, and it has a rare collection of mounted specimens of wild life in realistic surroundings.

The German Museum of Masterpieces of Natural Science and Technology, more often referred to as the Deutsche Museum, at Munich, is the most remarkable of its kind in the world. Here the histories of the major branches of science, engineering and industry are traced by exhibits of original machines and instruments or replicas of these. Similar museums but on a smaller scale have been modeled on this plan, the most important being mentioned under the United States section. The Imperial Natural History Museum, in Vienna, has noteworthy mineralogical and botanical collections.

Mention should be made of the Natural History Museum, in Lisbon, Portugal, which has an outstanding ornithological collection; the Musée Royal d'Histoire Naturelle de Belgique, in Belgium, famous for its paleontological collection; the Rijks Museum at Leyden, Holland, noted for its geological and zoological collections; and in Russia of the Imperial Academy of Sciences, Leningrad, which has large groups of specimens in the fields of zoology, paleontology and ethnology.

M. R.

See P. M. Rea, "Directory of American Museums of Art, History and Science" in Buffalo Society of Natural Sciences *Bulletin*, Vol. 10; E. E. Lowe, *Report on American Museum Work*, 1928; Sir Frederick Kenyon, *Libraries and Museums*, 1930.

**MUSHROOMS.** The term "mushroom" is popularly applied to certain forms of edible gill-fungi (*Agaricaceæ*) belonging to one of the two great groups of higher fungi (Basidiomycetes) and sometimes the term is even restricted to the one widely cultivated species (*Agaricus campestris*); while the contrasting term "toadstool" is applied to similar forms which are poisonous. By the scientist, however, the term mushroom is used in a somewhat broader sense including any of the higher fungi belonging to either of the two great groups (Basidiomycetes or Ascomycetes) whether edible or poisonous; hence we may have either edible or poisonous mushrooms. The Basidiomycetes, which contain the most important edible and poisonous mushrooms, comprise a number of families, among them, the *Agaricaceæ* or gill-fungi; the *Lycoperdaceæ* or puffballs; the *Clavariaceæ* or coral-fungi; and the *Polyporaceæ* or bracket-fungi.

The mushrooms are extensively used as articles of diet especially in old European countries and such use would be even more general were it not for the fact that a few of the species are deadly poisonous. Since the most widely cultivated edible species, the common field mushroom (*Agaricus campestris*), as well as the genus *Amanita* containing the most deadly poisonous species alike belong to the family *Agaricaceæ*, this family of mushrooms should be considered more in detail and the species should be handled with extreme caution by the mycophagist or the person who specializes in the use of fungi as articles of diet. The family *Agaricaceæ* is subdivided into four sections based on the color of the spores: the white-spored agarics; the rosy-spored agarics; the purple-brown-spored agarics; and the black-spored agarics. While all of these sections contain edible species the most deadly forms, belonging to the genus *Amanita*, are white-spored. If we therefore reject the white-spored species we will avoid the most deadly forms but at the same time we will reject a number of other white-spored forms which are valuable as articles of food.

The various tests which have been suggested, such as the silver-spoon test, whereby a poisonous mushroom may be easily detected are worthless. The only safe rule to follow is to know the individual species and learn to distinguish the good from the bad as one would discriminate between his human friends and enemies. There are hundreds of species of *Agaricaceæ*

and it is obviously impossible for the amateur to know them all. It is, however, comparatively easy to recognize the common field mushroom (*Agaricus campestris*) with its pink gills. To these could be added the various species of inkycap (*Coprinus*) which are characterized by having gills which deliquesce into an inky fluid; also the oyster fungus (*Pleurotus ostreatus*), although it has white spores, is characteristic because of its occurrence on rotten logs and its eccentrically attached stem giving to the fruiting body the appearance of an oyster. The milky-caps with their milky juice, belonging to the genus *Lactaria*, and the various species of the genus *Russula* with their brightly colored caps should be used with more discretion since some of the species are mildly poisonous. Starting with a few recognized species the amateur can gradually add to his circle of acquaintances among the gill-fungi without fear of disastrous results.

The puffballs belonging to the *Lycoperdaceæ* are all edible, provided they are collected in a young and fresh condition. The coral-fungi, *Clavariaceæ*, and the bracket-fungi, *Polyporaceæ*, are likewise non-poisonous. Many of the species, however, are too tough and woody to be successfully used as articles of diet. When sufficiently tender and crisp they may be used with impunity.

While most of the edible mushrooms belong to the Basidiomycetes, the Ascomycetes contain some well-known edible species. Among these are the morels of which the common morel (*Morchella esculenta*) is the best known species. The Ascomycetes also include the truffles, underground fungi which are extensively collected in Europe by the aid of trained animals, pigs and dogs. For a more detailed statement of the common mushrooms see the U.S. Department of Agriculture Circular No. 143.

F. J. S.

**Cultivation.** Commercial outdoor culture of the common mushroom is impossible except where temperature and moisture conditions are uniformly favorable, as in parts of England and France. Therefore caves, cellars, and mushroom houses have been used because in them cultural conditions are under control. Modern mushroom culture is a development of the present century. In former times "spawn" was imported from England and France, but America now produces her own. In 1903 B. M. Duggar, of the Missouri Botanical Garden, made experiments with "pure cultures," which resulted in commercial spawn production and the dissemination of cultural knowledge.

Prime essentials for success in mushroom growing are living spawn uniform temperature of about 52° to 54° F. as greater heat favors insect and disease enemies, moist but not soaking wet soil, good drainage, sufficient ventilation, freedom from debris and systematic trapping of injurious insects. M. G. K.

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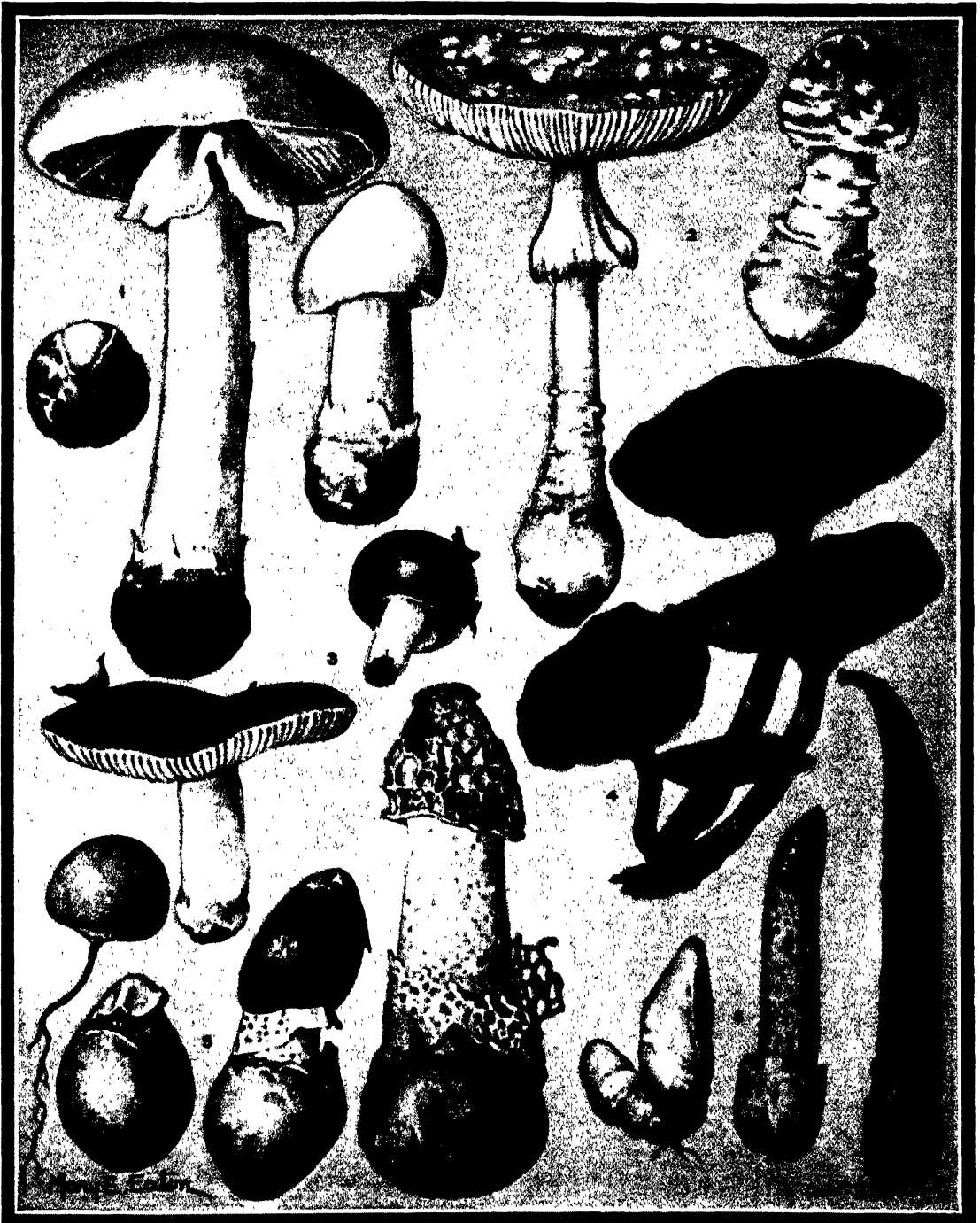
*Thousand American Fungi*, 1902; W. A. Murrill, *Edible and Poisonous Mushrooms* (colored chart with accompanying descriptive handbook) 1916; W. S. Thomas, *Field Book of Common Gilled Mushrooms*, 1928.

**MUSIC.** As the tonal expression of all nations; in song, with instruments, or in creative composition, music is closely allied with the social and public intercourse of mankind. Since the advent of the radio, tone-picture, television, mechanical sound-producing and reproducing devices in general, it has grown to play a preponderant rôle in the entertainment and culture of the masses. The present article deals successively with 1. the history of music; 2. musical instruments; 3. musical structure. A selected bibliography provides the reader with a list of pertinent volumes dealing with the three aspects of music aforementioned.

The history of music, unlike other arts, begins in legend for there are no tangible records left of its first appearance. Archaeologists have unearthed evidences of prehistoric painting, figures chiseled on the walls of caves and monuments, writings on papyrus or baked clay, but they have yet to discover one note of music similarly preserved in the ruins of ancient civilization. Yet music is referred to in those sculptured remains; the Old Testament records the blowing of rams' horns and the playing of various instruments and it is evident that before recorded history began, singing and dancing accompanied festivities and that martial music encouraged antediluvian men going to war. But while it was possible to picture musical instruments, sound could not be so easily captured; until the 11th century A.D. there was no musical notation, no tonal alphabet, and it remained to THOMAS A. EDISON in 1877 to audibly reproduce sound with his first PHONOGRAPH. To the historian, therefore, the origin of music is purely speculative. He reads, in Genesis 4: 21, that Jubal was the "father of all such as handle the harp and the organ"; in the 15th chapter of Exodus that Moses sang a song of triumph, accompanied by Miriam on a timbrel; he may follow the heroes of primitive Chinese drama, which sprang from singing and dancing, back to the 18th century before the Christian Era; but he *knows* that not until the ancient Greek dramatist, AESCHYLUS, began to feature choruses in plays, about 500 B.C., and PYTHAGORAS first "measured" tones in the same century, did music definitely take its place as one of the arts.

Meanwhile, folksong, arising from the poetic fancy, or ardor, of shepherds, priests, warriors and boatmen, had spread from the Orient to Assyrian, Egyptian and Grecian civilizations, and with the period starting from 313 A.D. was being adapted to religious services of the newly established Roman Catholic Church. Divorced from former paganistic, ceremonial dances and songs, and studiously developed along strictly sacred lines, this early Christian church music became the foundation of all the forms of tonal art that have since ensued. Following the experiments of Pythagoras, St. AMBROSE (341-397) of Milan added

# MUSHROOMS



PAINTED FOR THE NATIONAL ENCYCLOPEDIA BY MARY E. EATON

## INEDIBLE AND POISONOUS MUSHROOMS

1. Deadly Amanita (*Amanita phalloides*). Virulently poisonous. 2. Fly Agaric (*Amanita muscaria*). Virulently poisonous. 3. Field Russula (*Russula foetens*). 4. Jack-

O'-Lantern (*Clitocybe illudens*). 5. Veiled Stinkhorn (*Mutinus elegans*). 6. Headless Stinkhorn (*Dictyophora duplicata*). The four last named are more or less poisonous.



# MUSHROOMS



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## EDIBLE MUSHROOMS

1. Common Field Mushroom (*Agaricus campestris*).
2. Brick-Top (*Hypholoma perplexans*).
3. Shaggy Mane (*Coprinus comatus*).
4. Common Inkcap (*Coprinus atramentarius*).
5. Chanterelle (*Cantharellus cibarius*).
6. Large Field Puffball (*Lycoperdon cyathiforme*).





to the important idea of musical NOTATION by arranging tones in the shape of letters taken from the alphabet. In the 6th century, under Pope GREGORY I, this was standardized into a SCALE of eight notes and finally, in the 11th century, GUIDO D'AREZZO systematized the results so that chants and chorales could be put on parchment and sent on their missionary way, whereas before it had been necessary to entrust them solely to the faulty musical recollection of the papal couriers.

From this point on, HARMONY and COUNTERPOINT could be written down; the golden age of POLYPHONY was in force; a great era of investigation and development took place, reaching from Rome to HUCBALD, the French reformer of the Rheims school of music in the 10th century, and the Dutch master, Dufay, and the English contrapuntalist, JOHN DUNSTABLE, both of whom lived in the 15th century. The Council of Trent brought GIOVANNI PALESTRINA to the front a century later. Church music had become debased, according to the papal authorities. Songs of the streets had crept into the Church rituals. In St. Peter's at Rome, Palestrina purified this degenerated sacred music by composing masses of harmony for mixed voices, held together with a delicately balanced rhythm. Beginning in 1926, after 400 years, his works were revived by singing societies throughout the musical world.

Ultra-modern composers of to-day point to the Italian CLAUDIO MONTEVERDE as the father of the atonal system. In the 16th century, Monteverde was the first one to use discords in music. As the important pioneer-composer of OPERA, he also greatly elevated the lyric drama and to him may be attributed the idea of an OVERTURE. Then, following the polyphonic music of Palestrina and his contemporaries, ALESSANDRO SCARLATTI of Sicily (1659-1725) developed counterpoint to the extent that it readily passed into the hands of the great classicists north of the Alps. But in addition to this, Scarlatti also bridged the gap between the severe "sacred" style and the "modern" music of the 18th century to come.

During the Middle Ages, wandering minstrels had exerted a great influence in popularizing purely secular music. To his apprentice or servant, the troubadour or MINNESINGER usually relegated the musical end of his entertainments, preferring to recite his tales of warlike deeds and stories of love. It was apparent to Adam de la Hale (1230-88) that through these picturesque rovers a new era of romantic music was being born, and he strove, particularly with the troubadours of southern France, to develop them into trained singers and to bring the casual folksong of the country-side to a higher plane. Thus was the tonal expression of all Europe passing more and more into the daily lives of the common people. With the so-called "Hamburg Opera" (c. 1000), in reality a street fair, and the spreading of miracle- and mystery-plays, forerunners of the modern grand opera, carols, madrigals, secular music in general, was breaking away from the strict rules of churchly harmony and

counterpoint. This was indicated in Scarlatti's works and, in part, was anticipated by Monteverde. Moreover, the gatherings at fairs and dance festivals, to which the restlessness of itinerant gypsies added their natural abandon, brought the guilds of craftsmen to the idea of singing-societies as exemplified by the Meistersingers of Nuremberg, or the maypole celebrations in England. The principal scene of music's progress now shifted to Germany and Austria with the birth in Eisenach of JOHANN SEBASTIAN BACH (1685-1750).

The influence of this great master of contrapuntal writing is still paramount in modern musical history. Generally termed the "father of counterpoint," Bach was the leader of the Classical Age in music. He left to posterity an enormous list of works which, on account of their great purity of style and perfection of form, became the "bible" of all musicians after him, even with such radical composers as RICHARD WAGNER and IGOR STRAVINSKY down to the present day ultra-modernists. GEORGE FREDERICK HANDEL, his contemporary, shared the classical throne with Bach although it would be fairer to class Handel as the father of the ORATORIO. Because he spent most of his life in England during the reign of George III, that country customarily includes Handel as one of her composers. With FRANZ JOSEF HAYDN (1752-1809), primarily responsible for the string quartet-form, and expanding it, with the aid of other orchestral instruments, into the SYMPHONY, the classical age reached its apex. With these three masters must be included CHRISTOPH WILLIBALD GLUCK (1714-87), who was the pioneer composer of the heroic music-drama.

Starting with Bach, the Teutonic composers formed the chief musical milestone of the next 200 years. True, Italy continued to produce a distinguished list of operas by native writers, culminating with GIUSEPPI VERDI (1813-1901), and GIACOMO PUCCINI (1858-1924) (*see MUSIC, Italian*); French music, having contributed Josquin des Pres (1445-1521) and JEAN PHILIPPE RAMEAU (1683-1764) with his new harmonic discoveries, was soon to produce the orchestral impressionist, HECTOR BERLIOZ in 1803 (*see MUSIC, French*). England had had her 17th century HENRY PURCELL and John Gay (1685-1732) had written his *Beggars' Opera*, which is still played, but it was not until the 19th century that any European country, outside of Germany and Austria, produced an outstanding composer who created any new musical form.

The period known as the Romantic Age of music was ushered in by WOLFGANG AMADEUS MOZART (1756-91), whose wealth of compositions stood for impeccable style and graceful melody. He was followed by LUDWIG VAN BEETHOVEN, great master of the SONATA and SYMPHONY; FRANZ PETER SCHUBERT with a thousand songs in his new lied-form; KARL MARIA VON WEBER, composer of romantic grand operas; FÉLIX MENDELSSOHN-BARTHOLDY with his oratorios, CONCERTO and piano songs; ROBERT SCHUMANN, writer as well as composer; RICHARD WAGNER, giant of the music-drama; FRANZ LISZT, a Hungarian but

functioning with the German school, pioneer of the symphonic poem and great piano virtuoso; JOHANNES BRAHMS and ANTON BRUCKNER, both known for their symphonies and, in the case of Brahms, also for songs and piano works; GUSTAV MAHLER; MAX BRUCH with his famous violin concerto and choral works with orchestra; and, finally, RICHARD STRAUSS, whose symphonic poems for orchestra and heroic operas have, with Wagner, set the pace in elaborate orchestration and the modern lyric drama. The list is by no means complete. Besides many other composers of the Romantic Age, there appeared a great number of concert soloists and violin and piano virtuosos. FREDERIC CHOPIN, poet of the piano, is usually called a French composer although born in Poland. EDVARD GRIEG brought his characteristic harmonies and melodies from Norway and ANTON DVORÁK, similarly, from Bohemia. Denmark produced NIELS GADE; Finally, JAN SIBELIUS, and Sweden contributed OLE BULL, although he functioned almost exclusively as a violin virtuoso (*see Music, German*).

Russian music gave PETER I. TSCHAIKOWSKY (1840-93). The importance of this composer rests in the fact that he, perhaps more than any other, interpreted through his music the psychology of his countrymen. His *Symphonie Pathétique* particularly expresses this. His principal followers are NICOLAS A. RIMSKY-KORSAKOV, Modest P. Mussorgsky and IGOR STRAVINSKY (*see Music, Russian*).

French music, after Berlioz, is chiefly characterized by the 19th century GOUNOD, FRANCK, SAINT-SAËNS, BIZET, MASSENET and CLAUDE DEBUSSY, whose atmospheric use of the old Greek whole-tone scale established a new school (*see Music, French*). Of the modernists, MAURICE RAVEL (1875- ) leans to the romantic, while Darius Milhaud and the Swiss-born Arthur Honegger (1892- ) have composed in the atonal style (*see ATONALITY*).

With the exception of Isaac Albanez, Enrique Granados and Manuel de Falla, Spain has contributed no outstanding musical figures in this generation, in spite of the fact that for centuries that country has been a most romantic home of folksong, the dance and the Serenade.

In England, beyond the development of the BALLAD and important improvements in musical instruments, particularly the PIANOFORTE, nothing essentially new has been done since the time of Handel. SIR ARTHUR SULLIVAN (1842-1900) created the English comic-opera. The distinguished trio of present-day British composers includes Ralph Vaughan-Williams (1872- ), Gustav Holst (1874- ) and Cyril M. Scott (1879- ). T. St.

**Instruments.** The modern ORCHESTRA has grown to occupy a great share of the entertainment of to-day and in symphony concerts, on the radio, and with sound pictures the tones of a large and varied number of instruments are daily offered to the listener. The four divisions of the orchestra, the wood-wind, brass, string, and instruments of percussion, added important impetus to the progress of music and they

evolved from the FLUTE, the HORN, the VIOLIN and the DRUM. In the wood-wind family, comprised of the flute, PICCOLO, OBOE, CLARINET, SAXOPHONE and BASSOON, the first-named is undoubtedly the most ancient and in a primitive form was used by the early Orientals, Assyrians and Egyptians, entering Greek tradition as the *syrix*, ascribed to the god Pan. Bringing a pastoral character into music, this pipe-like wooden or silver instrument with lateral holes, held transversely and blown directly across its mouthpiece, thereby producing tones, is first noted in western Europe as a *tibia* by the abbe Herrad von Landsperg in the 12th century; keys and other modifications were made in its manufacture in France in the 17th century, and in 1846 Theobald Boehm, a Bavarian, established its present system of fingering.

The father of the brass family is the horn, whose origin is lost in antiquity. As an orchestral member, it first appeared in Italy in 1639, then was used by Bach and introduced into London orchestras by Handel, carried to France by Lully, and in the early 18th century became popular in German ducal opera-houses. From the broken-off horns of animals in prehistoric times, the horn was later made of wood and metal by the Egyptians, Assyrians and Semitic races before the Greek civilization, developing finally into the TRUMPET, bugle, French (hunting) horn, TROMBONE and TUBA; wind instruments with cup-shaped mouthpieces and valves, playing martial melodies, or soft or loud harmonic backgrounds in the symphony, opera or JAZZ dance-music.

As a bowed instrument with fingered strings, the violin originated with the *rebec* in the early Middle Ages, passed to the *viols* of the 15th, 16th and 17th centuries, and the early Italian makers, ANDREA AMATI and ANTONIO STRADIVARI of the 16th and 17th centuries not only produced violins but also violas, 'cellos and bass fiddles. German, French and English makers arose and a long list of famous violin virtuosos entered musical history, headed by NICCOLO PAGANINI (1784-1840).

The percussion instruments, which in modern orchestras may include everything struck, from tympani, cymbals and xylophones to the triangle, bells, piano, tom-tom and castanet, originated with the drum. In some form, and in all nations and ages, this valuable instrument was used to emphasize RHYTHM. It was popular in ancient civilizations as shown by murals and carvings found in Assyrian, Indian, Persian and Egyptian ruins, and before that no doubt was employed by savage tribes, as it is to-day in the jungles of Africa or Haiti. Employed in their pagan worship by the early Greeks and Romans and by the latter brought into Europe from the Turks, the drum was known in England before the Crusades, arriving into operatic orchestras in the 17th century.

The article describing the PIANOFORTE treats of the progress made in that useful instrument. The idea of mechanical players has always captured the imagination of the music-loving layman with neither time nor talent to master an instrument. As early as the

10th century the Italians invented the *organistrum*, parent of the old hurdy-gurdy and the modern street-piano. Records made by famous concert pianists may now be placed in a magazine-chamber in player-pianos and re-played automatically. In 1930 an interesting experiment was made public. This was the demonstration of reducing light waves to sound, and *vice versa*. The principle is logical, inasmuch as both light and sound are produced through vibration. By 1931 it had not been possible to prove, however, that the number of vibrations of a given tone would inevitably produce its corresponding, definite color.

**Musical Structure.** Starting with the basic rule in acoustics that tone, differentiated from noise, is sound set in free vibration, music, in its first essentials, is a sequence of tones of varied PITCH and duration. As a tonal art, to this sequence of tones is added rhythm and an organized harmonic structure, the whole noted down on one or more staves of five lines each (*see* NOTATION). Graded ascending and descending series of successive INTERVALS called a SCALE employ seven whole and half-tones named after the first seven letters of the alphabet, the half-tones occurring between the third and fourth and the seventh and eighth intervals in the MAJOR SCALE, and between the second and third, fifth and sixth and the sixth and seventh intervals in the MINOR SCALE. The CHROMATIC SCALE consists of 12 consecutive half-tones (*see also* INTERVAL).

In a musical composition, to this fixed system of intervals and its ramifications may be added HARMONY, the progression, according to certain, set rules, of three or more tones sounding simultaneously above a given bass; and COUNTERPOINT, the playing or singing of two or more independent melodic figures at the same time but in harmonic accord. And finally, RHYTHM, expressed by the accents of the singer or player, must be included.

Unaccompanied priestly intonations and chanted responses at first consisted of only a few tones, but after the invention of primitive organs in the 10th century the melodies used in the church services in Rome were extended to include more tones and the choral singing was in fourths and fifths. Adding boy-sopranos and male altos to this greatly enriched harmony, and after notation came into general use, complex and difficult polyphonic ensemble music was sung. Out of this grew the church MASS, a lengthy contrapuntal composition for choir, solos and organ, in several contrasting sections and devotionally dramatic to fit the moods of the text.

The classical string-quartet is played by two violins, a viola and a 'cello; the soprano, alto, tenor and bass voices of the string instruments. Composed of four contrasting movements, the quartet-form utilizes counterpoint almost exclusively in its construction and its various movements are quick, slow, tender, or gay, according to the moods laid down by the rules governing this musical form.

With the coming of the spinet and the harpsichord (*see* PIANOFORTE) in the 16th and 17th centuries,

the SONATA took hold of the classical age and was particularly developed in the 18th century. Written as an instrumental solo, this form of music not only displays the technique of the player but his interpretative talent as well. In the hands of Beethoven, the sonata told an abstract story. Usually in four contrasting movements and each based on two themes, Beethoven highly dramatized the piano sonata as in his op. 57, the *Appassionata*, and brought this form from a merely great style to a stage of fine appeal, tenderness and emotion.

The SYMPHONY is structurally like the sonata but, with the addition of orchestral instruments, more developed, owing to the fact that with different characteristic instruments, new tone-colors were available to the composer. But it requires great craftsmanship as well as style to write a symphony. There is the additional necessity of knowing how and when to use the many voices of the orchestra. Moreover, if a certain simplicity is not observed the work may easily become thick and muddy. In Beethoven's Fifth (C minor) Symphony, the first theme consists of only two tones (G and E flat) with the first one twice repeated but from only these four notes and a short second theme, page after page of the first movement is evolved. The second movement is elaborated from a slow melody in major eight measures long with only a few bass notes for the accompaniment and with variations; this simple theme is interestingly drawn out to 248 bars of music. The third movement, starting with a phrase of nine tones in a minor key, is taken at breathless speed. The last (fourth) movement is again in major and leads off with the full orchestra playing in brilliant *fortissimo*. Here the principal theme is of a triumphant, martial quality and the tempo is brisk and emphatic. From a half-hour to an hour is the time necessary to play a symphony. W. P.

**BIBLIOGRAPHY.**—*Grove's Dictionary of Music and Musicians*, 1878-79, and 3rd ed., 5 vols., 1927; J. Stainer, *Music of the Bible*, 1879; S. Jadassohn, *Musical Form*, 1885; O. Jahn, *Life of Mozart*, 1889-91; J. A. Zahn, *Sound and Music*, 1892; P. Spitta, *Life of Bach*, 3 vols., 1899; K. Schlesinger, *Instruments of the Orchestra*, 1910; E. Dickenson, *Early Church Music*, 1910; D. G. Mason, *From Song to Symphony*, 1926; T. Stearns, *Story of Music*, 1931.

**Greek Music.** The high cultural state of the Hellenic Empire leads naturally to the assumption that the art of music in Greece was similarly elevated. Such an assumption is not justified by Greek history. For reasons that are difficult to ascertain, Greek music was relatively unsophisticated and, while an object of philosophical admiration and logical scrutiny, devoid of many features which nowadays are considered indispensable. HARMONY, for example, was almost wholly absent, since the music of the Greeks was essentially melodic, and COUNTERPOINT was also lacking. Instruments were surprisingly few in number (the lyre and the flute were the chief ones), NOTATION was a crude alphabetical affair, and music served as a mere handmaiden to the dance and poetry. To elevate the music of the Greeks to any plane comparable

with that which was the lofty abode of drama, sculpture and abstract reasoning is at variance with historical data. The basic canons of the art, as they are now conceived, were non-existent.

Nevertheless, on the speculative side, music was the object of extraordinary interest and curiosity, from PYTHAGORAS onward, eliciting the praise of the greatest philosophers and mathematicians. In short, the actual practice of music was a humble enterprise, whereas the analysis of music, taking the form of scientific definition of intervals and the relationship between the lengths of vibrating strings and the tones engendered, was carried forward with enthusiasm and cunning. In this mathematical study of music the Greeks doubtless received aid from Egypt and Persia, and were anticipated in several discoveries. On the other hand, the mathematical basis of music was enunciated with more clarity in Greece than elsewhere and has thus been identified, more justly than it could have been with any other country or epoch, with Grecian civilization during the six centuries preceding the Christian era.

On the practical side, the contribution of Greece to music was extremely modest. One important exception, however, should be noted, namely, the elaboration of different species of scales called modes. Since these scale structures were later borrowed by the Western church and eventually rechristened, a fairly detailed exposition is necessary to insure clarity, and the reader is therefore referred to the article on MODE for a separate study of this signal contribution of Greek music. See also TONE; HEMITONE; TETRACHORD.

**BIBLIOGRAPHY.**—C. Engel, *Music of the Most Ancient Nations*, 1864-70; F. A. Gavaert, *Histoire et théorie de la musique de l'antiquité*, 1875-81.

**Italian Music.** The music of Italy may be described as the tonal expression of the Latin race springing from medieval church music in Rome, and the fountain-head of later music in all other lands. The birthplace of musical NOTATION, HARMONY, COUNTERPOINT and instruments whose descendants are the modern symphony ORCHESTRA, pipe organ and PIANOFORTE, Italy was also the cradle of OPERA. But developing in a land which for centuries was the leader of romance and culture in all the arts, Italian music particularly focused on and left to posterity the great school of vocal expression called *bel canto*. This combines simplicity, naturalness and grace with, owing to the emotional Italian temperament, an instinctive sense of drama further intensified by the tumultuous political events and intrigue that surrounded it in the making. Moreover, the pure vowels and musical inflections of the Italian language melted it naturally into singing speech.

Eight hundred years after Pythagoras's "measured" tones, St. Ambrose (341-397) of Milan arranged a primitive musical notation which, under Pope Gregory (c. 540-604), was standardized into a scale of eight consecutive tones, but not until the 11th century were these systematized by GUIDO D'AREZZO. With this

definite musical alphabet written music came into vogue and harmony and counterpoint were developed by Italian theorists, polyphonic music finally reaching its high-point with GIOVANNI PALESTRINA (1525-94). Sacred music veered to opera with CLAUDIO MONTEVERDE (1567-1643) whose deliberate use of fundamental discords has influenced ultra-modern composers. His opera *Arianna* raised the lyric drama to a level beyond his competitors. Thereafter Italian opera composers, from J. B. LULLY (1632-87) to GIUSEPPE VERDI (1813-1901) and GIACOMO PUCCINI (1858-1924), dominated the world's operatic repertoire until the rise in Germany of RICHARD WAGNER (1813-83), and still form its backbone to-day.

Besides giving the world at large its great impetus in music, Italy also set the pace in the invention of instruments. The "organum," father of the church organ, was devised there in the 10th century; this was followed by the forerunner of the piano, the clavichord, or the cymbalo, in the 14th century, which were the first keyed string instruments. Men like NICOLÒ AMATI (1596-1684) and Antonio Stradivari (1644-1737) produced violins, violas and 'cellos that the race of famous virtuosi, headed by Niccolò Paganini (1784-1840), especially prized. Certain of these models remain to-day supreme in their field.

If Palestrina paved the way in music for J. S. BACH (1685-1750) in Germany and contemporary classical composers of Europe, ALESSANDRO SCARLATTI (1659-1725) may be said to have linked 17th century music to the classical school of the next century, ending with WOLFGANG MOZART (1756-91), whose music remains more gracefully Italian than studiously Germanic. In a pronounced manner, Italian music was not only the foundation for all later music but, in most instances, the stepping-stone for generations for foreign composers, singers and instrumentalists. To-day, Italy as a music-producing country seems to be resting on its past laurels. The outstanding figure among present-day Italian musicians is Arturo Toscanini (1867- ), conductor of opera and symphony. PIETRO MASCAGNI (1863- ), by reason of his *Cavalleria Rusticana*, heads the contemporary Italian composers. Ottorino Respighi (1879- ), noted for songs and modern orchestral tone-poems, Ildebrando Pizzetti (1880- ) and Francesco Malipiero (1882- ) lead the ultra-modern school. T. St.

**BIBLIOGRAPHY.**—W. Lynd, *Account of Ancient Musical Instruments and Their Development*, 1897; R. A. Streathfield, *Masters of Italian Music*, 1895.

**German Music.** The Teutonic expression in tone ranges from the folk-song and the so-called "Hamburg Opera" (c. 1000 A.D.) through all the forms of music up to the present day. Following the development of early church music under GIOVANNI PALESTRINA in Rome, and the first opera by CLAUDIO MONTEVERDE in Venice, a period dating from the Council of Trent in 1562, to 1607, the art of vocal and instrumental music stamped its next definite impression in history among the German-speaking races. At the head of this movement, JOHANN SEBASTIAN BACH (1685-1750)

is frequently referred to as the "father of counterpoint" because he brought that form of composition to its greatest stage of perfection. In this classical style Bach's enormous output, as well as that of his gifted son, KARL PHILLIP EMANUEL BACH (1714-88), included not only a large amount of sacred music but also instrumental solos and ensembles, songs and dances. Reverence and strength, as well as spritely humor, characterized the music of the elder Bach particularly, and ever since then musicians of all nationalities, not excepting the ultra-modernists of to-day, have made his works the foundation of their studies.

To many equally important with Bach was GEORGE FREDERICK HANDEL (1685-1759), who likewise made a lasting impression on music although it would be fairer to class Handel more particularly as the "father of the oratorio." His life was largely spent in England where his outstanding work, *The Messiah*, was written. Numerous operas that he also composed there during the reign of George III have not survived him, however.

FRANZ JOSEPH HAYDN (1732-1809) completes the great trio of German pioneer composers of the classical age although Haydn, strictly speaking, was an Austrian, whose forebears were gypsies. Possibly it was on that account that with him music began to step further away from the fashion of writing in the strictly contrapuntal style. In spite of his many departures into the fields of oratorio and song, Haydn so polished the forms of the string quartet and the SYMPHONY that he is universally regarded as their first protagonist. The importance of these three men is that they not only greatly enlarged and perfected the existing form of music but they also brought it closer to the masses and, with perhaps a riper imagination, increased its popularity.

But German music was to become still more significant and, with progress in thought and personal expression along the lines of art, literature and science, to herald what is called the romantic age. Before Haydn, the stepping-stone from the purely classical to the age of romance in music was bridged by CHRISTOPH WILLIBALD GLUCK (1714-87), who had been impressed by the echoes of the medieval "Hamburg Opera" and the Miracle and mystery plays that had sprung from it. Gluck became the pioneer composer of classical opera, using for his plots the heroic dramas of the Greeks. Owing to his invention of the "leading theme" or leit-motif, dramatic music to-day, even in motion-picture music, may be traced directly back to him; and as Shakespeare is to the English drama, so Gluck stands in the realm of grand opera. The inspiration and polished technique of WOLFGANG AMADEUS MOZART (1756-91) in every form of music, from masses, operas and instrumental works down to the simplest songs, brought a refined strength into German music as well as a great purity of style.

Continuing the Romantic movement one great composer after another appeared, delivered his message and established definite cults. Prominent among them

were LUDWIG VAN BEETHOVEN (1770-1827), master of the symphony and the SONATA; FRANZ SCHUBERT (1797-1828), exponent of the song-form; CARL MARIA VON WEBER (1786-1826), composer of romantic operas and overtures; WILHELM RICHARD WAGNER (1813-83), creator of heroic music-dramas and elaborate orchestration; FELIX MENDELSSOHN-BARTHOLDY (1809-47), whose works include oratorios, concertos and piano-songs; FRANZ LISZT (1811-86), pioneer of the symphonic poem, a Hungarian but functioning with the German movement; ROBERT SCHUMANN (1810-56), celebrated for symphonies, songs and instrumental solos; JOHANNES BRAHMS (1833-97), composer of deeply thought-out symphonies, songs and piano works; and RICHARD STRAUSS (1864- ), creator of elaborate symphonic poems and grand operas. Besides these outstanding men in German music there have been a great number of lesser composers and virtuosi of the first rank. German music, it may be said generally, is characterized by an especially fundamental respect for the technical forms laid down by the classicists, a deep sentiment, keen appreciation of romance, and a lofty ideality.

The modern German composers, led by Arnold Schonberg (1874- ) and disciples such as Paul Hindemith (1895- ) and Alban Berg have been working in the atonal style which, briefly, eliminates set keys and functions in several of them simultaneously. German operetta, of Viennese extraction, is now turning to the tone-movie for its further expression, with increasing experiments toward the same end in television. T. St.

BIBLIOGRAPHY.—H. Riemann, *Musiklexikon*, 1900; W. H. Adow, ed., *The Oxford History of Music*, 1901-05.

**French Music.** The Gallic tonal expression has been developed principally in the dance, opera and instrumental forms rather than in vocal music. Early folk-song was not wanting and Adam de la Hale (1230-88) strove to develop wandering troubadours into trained singers, but it was not until Josquin des Pres (1443-1521) that a notable French composer appeared. Six decades passed before another outstanding native musician was born, in the person of JEAN PHILIPPE RAMEAU (1683-1764), who made new discoveries in harmony and who was appointed composer to the Court by Louis XV. More than six decades again intervened before HECTOR BERLIOZ (1803-69) took the reins of French music as the great international master of impressionistic orchestral composing. It is due to this dearth of native composers that in speaking of French music one is forced to refer to the activities of foreign-born musicians in Paris, who found their opportunities and development there.

Not especially designed for creative impulse in music, the French, during the Renaissance and even before, hospitably welcomed men with outstanding talents from other lands. The brilliant courts of the Louis kings offered cultural inducements and financial advancement to foreign composers and in many cases France absorbed them for her own. The Italian

LULLY, for instance, had established French opera before Rameau's time and after the latter's tenure it was reformed by GLUCK who was born in Austria and who vied with his Neapolitan rival, Piccinni, brought to Paris by MADAME DU BARRY, for ascendancy. Then the native Étienne Henri Mehul (1763-1817) wrote a typically French comic-opera during the Reign of Terror, but whether it was the German MEYERBEER, or the Hungarian LISZT; the Pole CHOPIN, or DONIZETTI, the Italian, the French musical fancy was seized by foreigners. Out of all this, and with instinctive Gallic charm, gayety and finesse, has risen the school of French music as it is to-day. After Berlioz its chief exponents are Frederic Chopin (1810-49), of French extraction though born in Poland, the great poet at the piano; CHARLES GOUNOD (1818-93); the Belgian, CÉSAR FRANCK (1822-90); CAMILLE SAINT-SAËNS (1835-1921); LÉO DELIBES (1836-91); GEORGES BIZET (1838-75); JULES MASSENET (1842-1912), master of theatrical effectiveness and flirtatious charm in music; VINCENT D'INDY (1851-1931); Claude Debussy (1862-1918), master of illusive harmonic impressions; Maurice Ravel (1875- ), a romantic modernist; and at the front of the ultra-modernists, Darius Milhaud (1892- ), and the Swiss-born Arthur Honegger (1892- ). T. St.

BIBLIOGRAPHY.—F. J. Fétis, *Histoire générale de la musique*, 1879-86; E. Dickenson, *History of Music*, chap. 18, 1910; Pierre Lasserre, *The Spirit of French Music*, 1921.

**English Music.** Although England is often referred to as an unmusical country, the charge in many respects is unjustified. Entirely apart from the specific musical activities of Wales and Scotland, and Ireland, which, however primitive, can boast of long heritage and have added much to the library of folksong, both the MADRIGAL and the GLEE have been extensively cultivated by English composers, from John Bull and WILLIAM BYRD onward; singing societies throughout England are exceptionally popular; such composers as Orlando Gibbons have enriched the church with anthems of the first order; the church hymnal has similarly been enriched by at least a dozen composers of outstanding merit; two of the finest musical histories extant are by Englishmen, JOHN HAWKINS and CHARLES BURNEY; one of the great composers of the world was an Englishman, HENRY PURCELL (1658-95); and in modern times England may point to creators of such solid attainment as Ralph Vaughan-Williams (1872- ) and SIR EDWARD ELGAR (1857- ).

Viewing the country in the large, the musical tastes of Englishmen are eclectic, and there is little evidence of any urge for the expression of national tastes and emotions in music. To this extent the English are not musical. In many other respects, however, the musical interests of England are extremely active and, as evidenced above, have given rise to much work of enduring value.

**Russian Music.** The Mongolian-Slavic races have been rich in folksong, their literature and music having sprung from the common origin of popular inspi-

ration. In the time of PETER I (1672-1725), visiting Dutch, French, German and Italian musicians governed the music of his court but when CATHERINE THE GREAT (1761-96) ascended the throne she encouraged the production of operas by such native composers as Volkoff, Formine, Titoff, men of the same era as HAYDN and MOZART but who are mostly unknown to historians. Not until the so-called "golden age" of Russian art, however, in the reign of Nicholas I, did the first popular Russian opera appear, composed by Alexis N. Verstovsky (1799-1862).

With the première in 1836 of the opera, *A Life for the Czar*, by MICHAEL IVANOWICH GLINKA (1803-37), the Russian school of music began. Glinka attracted a large following, including a group of youthful composers who called themselves "The Five," led by CÉSAR CUI (1835-1918). After Glinka's death this group carried on his work of nationalizing Russian music and eliminating foreign musical influences which had hampered the native composer. This ideal was furthered by a young army officer, Alexis Lvoff, who, in 1833, had composed a national anthem that swept over Russia. With Cui appeared three important composers: PETER I. TSCHAIKOWSKY (1840-93), one of the great figures in musical history; Modest Mussorgsky (1835-81), best known for his opera, *Boris Godounov*, and Nicholas Rimsky-Korsakov (1844-1908), forerunner of the ultra-modern school which was firmly set in motion by his pupil, IGOR STRAVINSKY (1882- ). ALEXANDER GLAZUNOV (1865- ) is known by his symphonic works and ALEXANDER SCRIBIN (1871-1915) for his lofty musical mysticism. Outstanding in Russian music is the piano virtuoso and composer, SERGEI VASSILIEVITCH RACHMANINOFF (1873- ).

By 1930 most of the great Russian talent had migrated to England and to the United States. These include the famous singer, FEODOR CHALIAPIN (1873- ); such conductors as OSSIP GABRILOWITSCH (1878- ) and Serge Koussevitzky (1874- ); and violinists including MISCHA ELMAN (1892- ), and JASCHA HEIFETZ (1901- ). The influence of the Russian school has spread beyond the borders of the nation. Its daring originality, brooding sentiment and strange rhythmic dash have found quick acceptance by western audiences and western composers.

T. St.

BIBLIOGRAPHY.—Rosa Newmarch, *The Russian Opera*, 1914; M. Montague-Nathan, *History of Russian Music*, 1915.

**American Music.** The history of American music is closely associated with the general history of America. Musical activities and development have followed in the wake of frontier advancement, generally commencing about 25 years after the founding of settlements in various centers of the country. Much of the native music, especially the current popular-song literature, forms a record of political events and personages, of social customs, and the viewpoints of each period in the national life of the country.

America has traditionally ranked below Europe in music for the reason that it is a younger nation. As

in many forms of art, American musicians have depended on foreign teachers for training, and have consequently leaned heavily on foreign patterns and methods for the expression of their ideas. To-day it may justly be said that America compares favorably with Europe in the possession of talented composers, endowed with ideas and technical facility, even though it lacks the heritage of centuries of folk-songs, which mold the idiom and musical speech of nationalistic composers of other lands. Some observers term Jazz the true folk-music of America, but this is too sophisticated and commercial a product to qualify as spontaneous folk-expression.

Little music was written in America until the middle of the 18th century. The Puritans and Pilgrims in New England used only the Psalm tunes they had brought with them from abroad, and waged many violent controversies over the propriety of singing them even in church. New York, Philadelphia and the South were more tolerant toward secular music and instruments, but no native composer appeared until the time of Francis Hopkinson (1737-91), signer of the Declaration of Independence, critic and humorist, and a man active in political as well as cultural affairs. Hopkinson wrote his first song, *My Days Have Been So Wondrous Free*, in 1759. See HOPKINSON, FRANCIS.

New England produced the first American to make the composing of music a profession. He was WILLIAM BILLINGS (1746-1800), a man who grew from a background of Puritan psalm-singing, but who tried to break away from its severe plainness by composing "fugue-tunes," crude imitations of the fugal writing of the masters. Billings' training was so meager that he failed to produce anything of lasting value, yet he was important in the music history of America, chiefly because he awakened the musical consciousness of New England, and founded a very definite style of "fugue" writing which had many followers, even though it suffered from a subsequent reaction, started by those who considered the "fugues" too florid for dignified religious worship.

In the last decade of the 18th century America experienced the first wholesale immigration of foreign musicians. When the United States had won its freedom it offered new opportunities to musicians, just as it promised them to those in other walks of life. A few years later the French Revolution drove many musical artists from France, who sought America as a refuge. The effect of this invasion was important; it brought to the New World teachers, performers and composers who were better trained and equipped than the American musicians, and it almost stifled native effort. The works of Billings and other composers almost disappeared from concert programs, and the names of the newcomers were featured in recitals at the expense of native artists.

Eventually the immigrants were absorbed, many of them were naturalized and their descendants to-day may boast a long line of American ancestors. At the end of the first quarter of the 19th century there was

little distinction between the native-born and those who had come from abroad. And the native composer returned to the field as a better trained musician. LOWELL MASON (1792-1872) and his colleagues were men of wider background than Billings, and they developed a hymnology which was in many respects a folk-music.

In the middle of the century a figure appeared who had much in common with Billings, since he had little or no musical training, and represented an entirely natural and native urge for music. This was STEPHEN COLLINS FOSTER (1826-64), composer of *Old Folks at Home*, *Old Black Joe*, and other quasi-sentimental songs which seem to be immortal. Foster was content with the things which were simple and natural to him. He wrote true folk-songs.

In the realm of concert music, Americans were less sure of themselves in this period, and another foreign invasion in mid-century pushed native effort once again to the background. The revolutions of 1848 in Central Europe drove many musicians to the United States, principally Germans. They settled both in the eastern cities, and in the West and mid-West. They immediately dominated all phases of musical life, and the American public was quick to recognize their superior attainments.

Failure to recognize the genuineness of Foster's songs and the value of those things which were truly American, even if simple and crude, and the insistence on conformity to foreign standards, caused the music written by Americans at this time to be highly imitative, slavishly patterned after the work of foreign composers. Yet foreign domination had also another effect; it caused the awakening of a national consciousness on the part of a minority who clamored for a hearing, claiming that the American composer was entitled to an audience in his own country, and that his music was worthy of comparison with the European product.

JOHN KNOWLES PAINE (1839-1906) was in many respects the first of the American symphonists, even though he was a strict conformist to foreign models. He was the first American composer to write symphonies and symphonic poems that were published and extensively played. He established a line of composers which extends to the present day, and which includes GEORGE W. CHADWICK (1854- ), ARTHUR FOOTE (1853- ), Mrs. H. H. A. BEACH (1867- ), and others of the so-called Boston group.

Edward MacDowell (1861-1908) was a contemporary of these Bostonians, yet not a part of the group, for his importance lay in his individuality. He was the first American to possess a musical idiom definitely his own, a style easily recognized. Fully equipped with a technique that enabled him to express his ideas fluently, he won recognition both abroad and at home as a creative musician of more than contemporary importance.

The American visit of the Bohemian ANTON DVORÁK, in 1892-95, exerted a profound effect on American music. Dvorák was an intense nationalist,

and it was natural that he should try to lead Americans back to their own soil, to an appreciation of the folk-music he found here. He wrote his *New World Symphony*, based on Negro and Indian themes, as an example of what might be done with native material.

This divided American composers into two groups: those who have tried to break away from European influence as quickly as possible by turning to folk-material, and those who have felt that such a course is self-conscious and artificial, and that nationalism must come spontaneously to Americans. Dvorák's influence has had an important effect in stirring Americans to an appreciation of their homely folk-songs—the songs of the negro, the homesick melodies of Foster, and the chants of the American Indians. The United States has become more honest in its appraisal of musical values.

The question of nationalism in America is one which involves a mixture of races. Little of its folk-music belongs to the entire nation; its nationalism is a matter of race or section, rather than of Americans or America as a whole. There is music belonging to the Negro, the mountaineer, the frontiersman, and other American peoples, and composers who make use of this material reflect the environment and temperament of the race or section whose songs they employ. It is possible that from all the scattered folk-material, negro songs, mountain ballads, cowboy songs, something characteristic of all Americans may develop, welded together by the sort of life that Americans lead. America has already produced jazz, a transplantation of negro idioms to Broadway; and while American music is not sophisticated jazz, jazz is undeniably American.

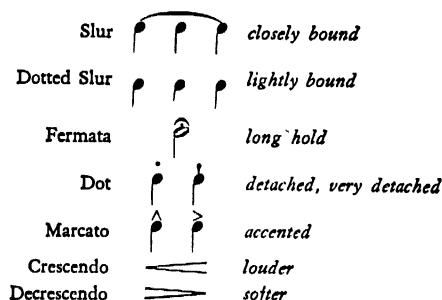
The United States has hundreds of contemporary composers to-day, a number of them producing music which is the equal of that written in post-war Europe, and in spite of complaints that the American composer is not receiving the hearing he deserves at the hands of his countrymen, his music is being played at recitals and by leading orchestras. Such men as CHARLES M. LOEFFLER (1861- ), JOHN ALDEN CARPENTER (1876- ), DEEMS TAYLOR (1885- ), Theodore Stearns (1880- ), Howard Hanson (1896- ), Leo Sowerby (1895- ), GEORGE GERSHWIN (1898- ), and such pioneers in modernism as Aaron Copland, Roger Sessions, Roy Harris and others, show the promise of American music, the hope that America will produce a native musical product which is honest and sincere, vital, and truly its own. J. T. H.

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**MUSICAL EXPRESSION.** Despite various experiments and theories looking to some exact method of indicating musical expression, none has so far been discovered; general suggestions rather than explicit commands are therefore necessary. The rules of musical NOTATION adequately take care of pitch,

as well as of the relative duration of the tones to be sounded; but the volume of the tones and all the smaller fluctuations of tempo, upon which the life of a musical interpretation is dependent, are left to the taste of the performer, the composer being able to do no more than hope that his hints will prove fruitful.

These hints may be grouped, for convenience, in two classes: 1. arbitrary signs placed below or above the notes; and 2. verbal directions which are commonly in Italian. The former are almost pathetically few in number, namely, the slur, the dotted slur, the *fermata*, the dot, the *marcato* sign, and the *crescendo* and *decrescendo* symbols. These are illustrated respectively as follows:



The second class of musical expression marks are verbal directions, falling into two groups as follows:

#### I. TEMPO

Uniform	Faster	Slower
Largo <i>very slow</i>	Accelerando	Meno mosso
Adagio <i>slow</i>	Stringendo	Piu adagio
Lento <i>slow</i>		
Andante <i>a little motion</i>	Piu Mosso	Piu largo
Allegretto <i>trippingly</i>		
Allegro <i>fast</i>	Incalzando	Rallentando
	Calcando	
Presto <i>very fast</i>	Pressando	Ritardando
Prestissimo <i>fastest possible</i>	Piu stretto	Slargando
		Tardando
	Poco a poco animato	Strascinando

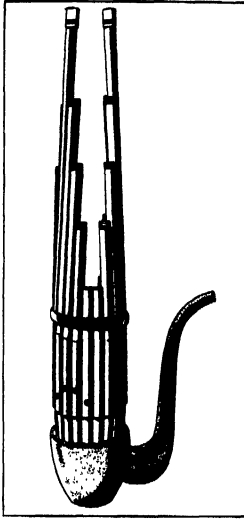
#### II. DYNAMICS

Uniform	Louder	Softer
Pianissimo (pp) <i>very soft</i>	Crescendo	Decrescendo
Piano (p) <i>soft</i>	Piu forte	Diminuendo
Mezzo piano (mp) <i>fairly soft</i>	Rinforzando	Calando
Mezzo forte (mf) <i>fairly loud</i>	Meno piano	Smorzando
Forte (f) <i>loud</i>	Accrescendo	Raddolcendo
Fortissimo (ff) <i>very loud</i>		Morendo
Con tutta forza <i>as loud as possible</i>		Meno forte

The foregoing Italian terms do not exhaust the vocabulary of musicians, but they are the chief ones to be found throughout music and thus may be taken as representative. French composers occasionally use French terms, and sometimes the Germans use their own. However, the Italian terms are internationally understood.



**MUSICAL INSTRUMENTS.** The sounds from musical instruments are produced by the vibration of strings, as in a piano, harp or violin, by the vibration of air columns, as in an organ pipe, by the vibration of a diaphragm, as in a drum, by the vibration of a disc, as in cymbals, or by the vibration of solid bodies, as in xylophones. In stringed instruments, the vibrating member is associated with an extended surface, usually made of wood, such as the sounding boards of the piano and harp and the body of the violin. The greater area of this extended surface, set into vibration by the string, imparts more motion to the air than would the unaided string. The high quality of a Stradivarius violin results from the maker's choice of wood and his skill in fashioning the body. The **PITCH** of a string



COURTESY M. M. OF ART  
CHINESE CHENG OR MOUTH  
ORGAN, WITH FREE REEDS  
19th century

is determined by its length, mass per unit length and tension. Tuning is done by adjusting the tension.

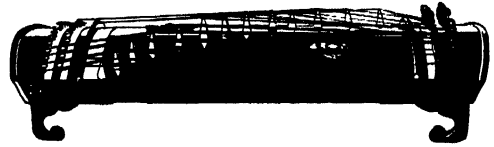
The pitch of a vibrating air column, as in the organ pipe, is largely a matter of its length. The **WAVE-LENGTH** of the lowest tone emitted by an open pipe is approximately twice the length of the pipe while the wave-length of a stopped pipe is four times its length. An open pipe, therefore, speaks an octave higher than a closed pipe of the same length. The pitch of the flute is controlled by opening and closing small holes in the tube, thus altering the effective length of the air column. The clarinet, oboe and bassoon have mouth-pieces fitted with reeds which serve as the primary vibrator, these acting on the air column. The pitch is controlled both by varying the length of the air column and by the manner of blowing. In brass instruments, such as horns and trumpets, the lips of the performer produce the primary vibration and the pitch is varied by valves which regulate the length of the air columns.

Drums are of two types: those having a definite pitch, as the kettle drum, and those having an indefinite pitch, as the bass drum, the tenor drum, the snare drum and the tambourine. Modern cymbals have an indefinite pitch. The pitch of the bars of a

xylophone is a function of their size. *See also* **MUSICAL SOUNDS; MUSICAL SCALES.** P. E. S.

**MUSICAL NOTES**, letters in musical notation, which serve as symbols for the successive tones of an octave scale.

**C**, the first tone in the model diatonic scale of C-major (based on the white notes of the piano-



COURTESY M. M. OF ART

YO-KIN, A JAPANESE STRINGED INSTRUMENT

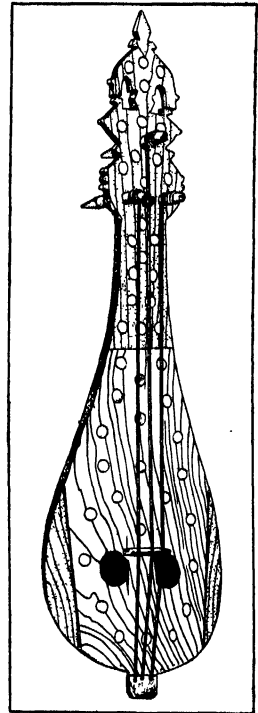
forte), which is the relative major of the scale of A-minor, as the scale of C-minor, having three flats, is the relative minor of E-flat major. Unlike every other scale, the C-major scale has no flats or sharps in its signature. Middle C, often taken as a standard of reference, is that C which lies approximately in the center of the pianoforte keyboard.

**D**, the second tone in the model diatonic musical scale of C-major, forming the interval of a major second with the C below it and the interval of a minor seventh with the C above it. The scale of D-major, having two sharps, is the relative major of B-minor, and the scale of D-minor, having one flat, is the relative minor of F-major.

**E**, the third tone in the model diatonic scale of C-major, forming the interval of a major third with the C below it, and the interval of a minor sixth with the C above it. The E-minor scale is the relative minor of the scale in G-major, while the E-major scale is the relative major of the scale in C-sharp minor.

**F**, the fourth tone in the model musical scale of C-major, forming the interval of a perfect fourth with the C below it, and the interval of a perfect fifth with the C above it. The scale of F-major is the relative major of the scale in D-minor, while the scale of F-minor is the relative minor of the scale in A-flat major.

**G**, the fifth tone in the model musical scale of C-major, forming the interval of a perfect fifth with



COURTESY M. M. OF ART

REBEC FROM CRETE  
19th century

COURTESY  
INDIAN SITAR

the C below it, and the interval of a perfect fourth with the C above it. The scale of G-major, having one sharp, is the relative major of the scale in E-minor, and the scale of G-minor, having two flats, is the relative minor of the scale in B-flat major.

A, the sixth tone in the musical scale of C-major, forming the interval of a major sixth with the C below it and the interval of a minor third with the C above it. The scale of A-minor is called the relative minor scale of C-major, while the scale of A-major, having three sharps, is called the relative major scale of F-sharp minor. It is the name of the tone which usually serves as the standard in orchestral tuning and by the American Federation of Musicians is scientifically defined as having 440 vibrations per second.

B, the seventh tone in the scale of C-major, forming the interval of a major seventh with the C below it and the interval of a minor second with the C above it. The scale of B-minor is called the relative minor scale of D-major, having two sharps, while the scale of B-major, having five sharps, is the relative major of G-sharp minor. See CONCERT PITCH; TEMPERAMENT; OCTAVE.

**MUSICAL SCALES**, a sequence of tones whose frequencies bear definite numerical relations to each other. Many different scales have been, and are, used in the music of civilized peoples.

The change in PITCH in passing from one tone to another in a musical scale is called the *interval* between the two tones. This change is measured not by the difference in FREQUENCY, but by the ratio of the frequencies producing the tones. All scales used in modern music are based on the interval of the *octave*, i.e., the interval between two tones whose frequencies are in the ratio of 2 to 1. At present, musical scales consist of 12 different frequencies spaced at equal intervals, these 12 tones taken in succession constituting the *even-tempered chromatic* scale. The frequency ratio between any tone and the one next higher is the ratio of 1 to the 12th root of 2, or 1 to 1.0594. This interval is called an *even-tempered semitone*. The even-tempered scale is advantageous in that the interval between any two tones separated by a given number of semitones is always equal. Hence, any sequence of tones may be reproduced starting on any tone as the keynote. The tempered scale was invented by Johann Sebastian Bach.

In the physical, or natural, scale, the semitone intervals do not all have the same frequency ratio. On the physical scale, however, the consonant intervals correspond to frequencies which are to each other as integral numbers. Thus the tones, C, E, G, C, of the major chord have on the natural scale the frequency ratios are 4, 5.04, 5.99, 8.

Keyed musical instruments, such as the piano and organ, are tuned to the tempered scale. The internationally adopted standard of pitch assigns to A above middle C of the piano, a frequency of 435 vibrations per sec. The tone, A = 440, is also much used for band and orchestral instruments. The physical scale is based on a frequency for middle C of 256

vibrations per sec. The frequencies of the tones of the octave above middle C are as follows:

	Physical Scale	Tempered Scale A = 435
C	256	258.6
C#		274.0
D	288	290.3
D#		307.6
E	320	325.9
F	341.3	345.3
F#		365.8
G	384	387.5
G#		410.6
A	426.7	435.0
A#		460.9
B	480	488.3
C	512	517.3

P. E. S.

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**MUSICAL SOUNDS**, sounds produced by bodies which are in sustained vibration at a definite frequency. The successive condensations and rarefactions of the air follow each other at regular intervals and repeat themselves in succeeding intervals. A musical sound of a given frequency is spoken of as a musical *tone*.

The ear distinguishes three properties of musical sounds, viz., their PITCH, quality and loudness. The pitch is characterized as either high or low, and is determined by the frequency of vibration of the sounding body. Quality is that property of musical sounds by which the ear distinguishes the sounds from different musical instruments when producing tones of the same pitch. Difference in loudness of two tones of the same pitch and quality is due to a difference in the amplitude of vibration of the sounding body. In terms of the sounding body, the pitch of the sound depends upon the frequency of vibration, the loudness upon the amplitude of vibration and the quality upon the mode of vibration.

The quality of sound from a musical instrument is determined by the number and relative intensities of the *overtones*. A string set in vibration vibrates as a whole, and at the same time breaks up into two or more equal segments. These segmental vibrations produce tones whose frequencies are exact multiples of the frequency of the whole length of the string. The sound produced will therefore be complex, consisting of a series of tones whose frequencies are in the ratios 1, 2, 3, 4, and so on. The lowest frequency, that of the string as a whole, is the *fundamental tone* of the string and usually determines the pitch which the ear recognizes as the pitch of the complex sound.

Individual differences in human voices are chiefly differences in quality. The vibration frequency of the vocal cords determines the pitch of a voice sound. Its quality depends upon the shape and size of the various cavities of the throat, nose and mouth which affect the relative intensities of the overtones. Each vowel sound is characterized by strong reinforcement of overtones lying within one or two definite frequency bands.

The frequency range of audible tones varies with different individuals as well as with the intensity of the sound. Roughly, the audible range may be said to extend from 16 to 30,000 vibrations per sec. The pitch range ordinarily found in music is from 26 to 4,138 vibrations per sec. The accompanying chart gives the ordinary pitch ranges of some of the important musical instruments. *See also* MUSICAL SCALES; MUSICAL INSTRUMENTS.

Instrument	Range Vibrations per sec.
Organ (International Pitch) . . . . .	32-4136
Piano " " . . . . .	26-4138
Violin . . . . .	194-3284
Viola . . . . .	129-1740
Violoncello . . . . .	64-870
Double bass . . . . .	48-240
Flue (in D) . . . . .	258-2069
Piccolo . . . . .	548-3480
Clarinet (in Bb) . . . . .	145-1381
Cornet (in Eb) . . . . .	217-1230
Woman's voice . . . . .	193-870
Man's voice . . . . .	86-435

P. E. S.

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**MUSICIAN**, an **ARTIST** who is skilled in one of the various musical forms. The term includes instrumentalists, vocalists, composers, orchestra or band directors, teachers, and orchestrators. It may broadly be said that every musician is adept in the technique demanded by at least one instrument. Instrumentalists, therefore, constitute the largest group. They should have a training calculated to give them mastery of their chosen instrument. Vocalists, or those who practice the art of singing, have at their command the largest literature of all music. The art of the actor, as well as a fine voice, is essential for an operatic career.

Composers constitute a smaller class. They need, beside instrumental training, a knowledge of harmony and of musical theory. They must be conversant with the limitations in range and quality of all voices and instruments. The composer should have, before all else, a natural musical inventiveness.

Orchestra conductors and band leaders have usually perfected themselves in one or more instruments, but they must also have a general knowledge of music and a flair for leadership and organization. Directors must train the several instrumentalists, who compose an ensemble, to play together and to give an acceptable interpretation of a musical composition.

Teachers of vocal or instrumental music need not possess the technique of a virtuoso, but they should have a thorough knowledge of the ways in which music is best produced from the instrument upon which they specialize and some knowledge of teaching methods.

Orchestrators are probably the smallest group of musicians. They arrange music into a form suitable for presentation by a band, orchestra, ensemble or chorus. The training required for this type of musician is most comprehensive, requiring conversancy

with the whole range of the literature of music, together with a talent for composition and a sound sense of instrumental combination and balance. Many of the great composers were fine orchestrators.

F. J. B.

**MUSK-DEER** (*Moschus moschiferus*), a small ruminant closely allied to the deer but differing from it in various peculiarities. There are no antlers; the male possesses long upper canine teeth which project like tusks downward over the lower lip; the abdomen of the male contains a gland which secretes musk, and the "false hoof" comes to the ground. The musk-deer inhabits the high Himalayas and the mountain heights of Tibet, eastern Siberia, and northwestern China, ranging far above the tree-line in the summer. It is active, agile, shy and solitary, and roams only at night. Though proportionately long of limb, the musk-deer stands only 20 in. high at the shoulders. To obtain the musk the animal is killed and the secreting gland removed and dried. Frequently also the secretion is found deposited on rocks, in which case it is scraped up. The demand for musk is so great that the animal is now comparatively rare.

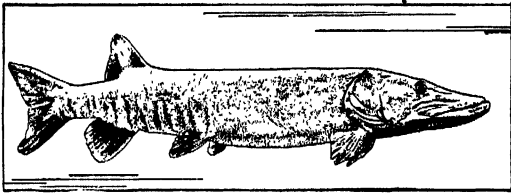
**MUSKEG**, an American Indian word commonly used in forest regions of northern Canada to describe the tussocky peat bogs which preempt large areas at a latitude of about 55°. Small evergreen trees and shrubs often flourish in these bogs along with peat moss (sphagnum), rushes, and water-plants. Treacherous morasses in summer, they are favorite hunting and trapping grounds when frozen during the long Canadian winter.

**MUSKEGON**, a city of southwestern Michigan, the county seat of Muskegon Co., situated at the confluence of the Muskegon River with Lake Michigan, called Lake Muskegon, about 38 mi. northwest of Grand Rapids, 95 mi. northwest of Lansing and 193 mi. northeast of Chicago. Transportation facilities include the Pennsylvania, the Père Marquette and the Grand Trunk railways, bus lines and airports. The channel connecting Lake Muskegon with Lake Michigan has been so widened and deepened that the city can ship lumber and other products directly to all lake ports, and the United States Government is completing a breakwater which will make possible navigation by ocean liners and shipping to all parts of the world. Muskegon is in the heart of a picturesque resort region and has a delightful summer climate. Fruit and celery are among the leading crops. There are important manufactures, including iron and steel castings, automotive products and office and school furniture, with an approximate total value in 1929 of \$66,000,000; the retail trade amounted to \$32,845,559. In Muskegon is the grave of Capt. Jonathan Walker, whom Whittier immortalized in *The Man with the Branded Hand*.

A sawmill was built upon the site of the present city in 1837; Muskegon was incorporated in 1870. Pop. 1920, 36,570; 1930, 41,390. On Nov. 14, 1931 a district comprising 2½ sq. mi. was annexed to Muskegon, increasing the population by about 6,000.

**MUSKEGON HEIGHTS**, a city of Muskegon Co., western Michigan, situated 4 mi. south of Muskegon, on the Muskegon River. Two railroads, buses and three steamship lines afford transportation. The city is a popular summer resort and is surrounded by a farming, dairying and fruit-growing region. Its chief manufactures are piston rings, castings, refrigerators, electric cranes and foundry products. In 1929 the retail trade amounted to \$5,730,906. The home of the World-Wide Christian Couriers is near by. Incorporated as a village in 1891, Muskegon Heights became a city in 1903. Pop. 1920, 9,514; 1930, 15,584.

**MUSKELLUNGE**, a fine fresh-water game and food fish (*Esox masquinongy*) of the Pike family, found in the deeper waters of the Great Lakes region. It has a long slim body, golden-olive in color thickly spotted with black above, and often attains a length of 6 ft. and a weight of 60 to 80 lbs. Swift, strong and voracious, it preys dauntlessly upon other fishes.



MUSKELLUNGE

The muskellunge is one of the most courageous and powerful of American fresh-water game fish, testing the skill of the best anglers. The Ohio muskellunge (*E. masquinongy ohiensis*), a smaller variety found from Chautauqua Lake to the upper Mississippi Valley, sometimes attaining a length of 5 ft., is an excellent food fish. It has been successfully propagated by fish hatcheries in New York. See ANGLING.

**MUSKET.** See GUN.

**MUSKHOGEAN**, an important North American Indian linguistic stock comprising five dialects, as follows: Muskogee, including part of the Creek Confederacy and the Seminole; Hitchiti, including the lower Creeks, the Mikasuki band of the Seminole; Koasati, including Alibamu and Wetumpka; Choctaw, including Choctaw and Chickasaw; and the Natchez. The Muskhogean occupied the Gulf Coast States east of the Mississippi, all of Mississippi and Alabama, and parts of Tennessee, Georgia, Florida and South Carolina, though traditionally their origin was west of the Mississippi, probably on the Red River. Most of the Muskhogean tribes are now on reservations in Oklahoma. Though not absolutely homogeneous physically and culturally, all the Muskhogean tribes were sedentary agriculturists, living in villages, often palisaded. The Creek and Choctaw each with their subject tribes formed confederacies. They had an exogamous clan organization, each town or tribe with its war and administrative chiefs being autonomous within the confederacy, which was ruled by a council of representatives from all the constituent tribes. The Muskhogean played the chunky game and per-

formed the busk or green corn dance, an important ceremonial which was a harvest celebration, accompanied by the kindling of new fire. Some of the Muskhogean, particularly the Choctaw, practiced deformation of the head and consequently were sometimes called **FLATHEADS**. The Muskhogean were early in contact with European explorers and colonists, the Apalachee having been encountered by Panfilo de Narvaez in 1528. Before the 18th century the Apalachee were already Christianized by the Spanish Franciscans. The French at Mobile were in contact with the Biloxi, while the Creek and Chickasaw were in close contact with the English. European colonization, however, caused their westward migration, since they crossed the Mississippi in 1765. At the close of the Creek and Seminole wars in the 19th century, most of the Muskhogean had been removed to Oklahoma, some Seminole remained in Florida, some Choctaw in Mississippi, Alabama, and Louisiana, and a few Creek in eastern Texas.

**MUSKINGUM COLLEGE**, at New Concord, O., a coeducational institution, chartered in 1837. Later it came under the direction of the United Presbyterian Synod of Ohio. Its productive funds in 1931 totaled \$950,000. The library contained 22,000 volumes. In 1931-32 the student enrollment numbered 675, and the faculty of 55 was headed by Pres. J. Knox Montgomery.

**MUSKMELON** (*Cucumis Melo*), a trailing vine of the gourd family; also its large, fleshy fruit, so named because of its usually musklike odor. It is a hairy prostrate trailer with grooved, somewhat angled stems, roundish or kidney-shaped, wavy-toothed leaves, and yellow flowers borne mostly singly in the leaf-axils. The fruit is a globular or oblong berry-like structure (pepo), sometimes a foot in diameter, with a soft or hard rind enclosing an edible pulpy interior containing numerous seeds.

The plant, probably a native of central Asia, has been cultivated from about the beginning of the Christian Era, especially in India and the Mediterranean region; since the Renaissance its culture in many improved varieties has spread widely throughout temperate regions. The muskmelon was one of the first Old World plants introduced into America. Companions of Columbus are said to have grown it in 1494; it was observed along the St. Lawrence in 1535, in New Mexico in 1540, along the Hudson in 1609 and in New England in 1629.

The muskmelons most commonly grown in the United States are of three classes: 1. the netted or nutmeg melons (var. *reticulatus*), with rather small fruits bearing a soft, net-ribbed rind; 2. the **CANTALOUPE** or rock melons (var. *cantalupensis*), with a hard, frequently furrowed, warty or rough rind; 3. winter melons (var. *inodorus*) with large, white-fleshed, nearly odorless fruits maturing late and keeping in winter, including the Cassaba and related melons.

In the United States muskmelons constitute an important commercial crop usually outranking in value

## MUSKMELONS, COMMERCIAL PRODUCTION, U.S.

4-Year Average, 1927-30

Division	Acreage	Production (Crates)	% of Tot. Prod.
UNITED STATES .....	110,040	15,689,000	100.0
LEADING STATES:			
California .....	51,065	6,180,000	39.4
Arizona .....	11,800	1,953,000	12.5
Colorado .....	10,525	1,809,000	11.5
Maryland .....	6,710	631,000	4.0
New Jersey .....	3,475	438,000	2.8
Indiana .....	4,398	425,000	2.8

that of all other vegetables marketed fresh except tomatoes and lettuce. Since 1900 muskmelon culture under irrigation has been extensively developed in the western states, notably in the Imperial Valley, California. In 1930 the total commercial crop was valued at about \$18,600,000, of which California produced 53.3%, Arizona 13.5%, and Colorado 13%.

A. B. J.

**MUSKOGEE**, a city in eastern Oklahoma, the county seat of Muskogee Co., situated near the meeting of the Grand, the Verdigris and the Arkansas rivers, about 50 mi. southeast of Tulsa. Hat Box Field, an airport, is located here. The city is a railroad center, served by four lines, and a market for the crops of the vicinity, chiefly cotton, grain and potatoes. Among the principal manufactures are cotton, cotton seed oil and railroad shop products. The manufactured output, 1929, was worth \$14,826,720. The retail business in 1929 amounted to \$18,358,099. Muskogee was founded in 1872. While Oklahoma was a territory the affairs of government were directed from here. Located in the city are a United States Veterans' Hospital, the Oklahoma School for the Blind, a junior college and the headquarters of the Indian Agency for Five Civilized Tribes. Bacone College, just outside Muskogee, is an Indian university (Baptist). Pop. 1920, 30,277; 1930, 32,026.

**MUSK OX** (*Ovibos moschatus*), an oxlike mammal, found only in the barren lands of northern Canada and in northern Greenland. The Greenland animal, called the white-fronted musk ox because of



MUSK OX

white hair on the forehead, is considered a separate species by some writers. Zoologically, the musk ox is intermediate between the ox and the sheep, though curiously enough, as in the case of the American bison, it has 14 pairs of ribs.

The male stands about 5 ft. at the shoulder. The head is large and heavy, and the low-sweeping, forward-pointing horns meet in the middle of the forehead, covering the brow and crown with a solid mass of bone; in the female, however, the horns do not meet. The muzzle is covered with short hair and the body with long, thick brown hair, often so matted on the shoulders as to suggest a hump. The body is further protected from the arctic cold by thick soft under-fur, shed in summer. The animal has short stout legs and large unsymmetrical hoofs with curved toes. The musky odor of these animals is not due to musk glands.

Musk oxen live in herds of from 15 to 100, feeding on grass, lichens, moss and young trees. The female brings forth a single young in the early summer. When attacked by animals or approached by man, the females and calves are surrounded by a circle of bulls, facing outward with lowered horns. Eskimos and white hunters have slaughtered the musk ox so extensively that it is faced with extermination except in the farthest North.

A. R. F.

**MUSK PLANT** (*Mimulus moschatus*), a creeping perennial of the figwort family grown for its showy flowers. It is found in the United States from the



FROM JEPSON. MAN. FL. PLANTS CALIF., COPYRIGHT

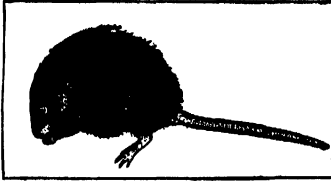
MUSK PLANT

Rocky Mountains westward. The weak stems, 6 to 10 in. high, bear woolly, musk-scented, sticky-slimy leaves and pale yellow flowers, an inch long, produced singly from the upper axils.

**MUSKRAT** (*Ondatra zibethica*), an American aquatic rodent ranking commercially as one of the most important fur-bearing animals. The name refers to a scent gland present in both sexes. Muskrats are

about a foot long. The hairless tail, almost as long as the body, is laterally flattened, and serves as a rudder.

Musk rats, also called by the old Indian name of musquash, are found all over North America in marshes and on the shores of lakes and rivers. They feed on various aquatic plants and roots, being especially active at night. In marshes, they build dome-



MUSKRAT

shaped houses somewhat resembling those of the beaver, but smaller and made of rushes and grass. The muskrat does not cut down timber or build dams, but is often very destructive because of its habit of burrowing through earth dams and embankments.

Muskrat fur is used in the natural state, dyed to imitate more expensive furs and sold under many fancy names. The naturally black pelts from New Jersey and Maryland bring the best prices. Many muskrats are raised on fur farms. A. R. F.

**MUSK ROOT** (*Ferula Sumbul*), a medicinal plant of the parsley family called also sumbul. It is a native of Bokhara and adjacent parts of Asia. The root is used as a substitute for musk and also in medicine, having properties similar to those of asafetida. The name is applied to various other plants with musky-scented roots.

**MUSSEL**, the popular name for bivalve mollusks belonging to two super families, one of which (*Mytilidae*) is found in the sea, while the other (*Unionidae*) has colonized fresh water. The most familiar marine species is the edible mussel (*Mytilus edulis*), found between the tide marks and in shallow water on both sides of the Atlantic, and on the Pacific coast of the United States. It has a black or brown shell, and may grow to be four inches long. This mussel is considered good to eat and it is also used for bait.

Of the fresh water mussels the most important are the members of a genus (*Unio*) common in the southern United States, especially in the Mississippi River. The thick dark brown or green shell is lined with beautiful mother-of-pearl, which is used to make buttons. In these mussels, too, fine fresh-water pearls are sometimes found.

In 1929 54,352,000 lbs. of mussel shells valued at \$1,325,000 were taken from streams in the interior of the United States, about three-fourths from the Mississippi and its tributaries and the remainder in the Great Lakes region.

**MUSSET, ALFRED DE** (1810-57), French poet and dramatist, whose full name was Louis Charles Alfred de Musset, was born in Paris, Dec. 11, 1810.

In 1830 his *Contes d'Espagne et d'Italie* appeared with great success, the somber beauty of his writing, combined with his extreme youth and dandyism, making him the literary man of the moment in Paris. Poems and plays followed apace, including the noted poem, *Rolla*, but in 1833 a new direction was given to his genius as a result of his tragic love affair with the French authoress GEORGE SAND. From this relation Musset emerged as a poet of the first rank. In 1836 *La Confession d'un Enfant du Siècle* appeared in which he gave an account of the sufferings the experience had caused him. Musset was admitted to the French Academy in 1852, but by this time his poetical powers had left him. He died in Paris, May 2, 1857.

**MUSSOLINI, BENITO** (1883- ), Italian statesman, born July 29, 1883, at Dovia in the Romagna. His father, a man of no formal education, was a blacksmith who had internationalist, revolutionary and anti-religious convictions. His mother was a school teacher. From the former, Benito received his early political ideals; from the latter, he gained a taste for letters and the ambition to rise to great heights. After completing his preliminary education he went to normal school and, at the age of 18, received a license to teach. Despite the fact that he had displayed a stubborn, insubordinate and passionate spirit prior to his graduation, he received an appointment at Gualtieri which carried a stipend of 56 lire (about \$11.20) a month. After a year of life as a rural school teacher he decided (1901) to try his fortune in Switzerland. During the three years which he spent there, he did manual labor, which at times rewarded him so poorly that he had to beg his bread; he studied at the University of Geneva, where he secured a diploma enabling him to instruct in French; and he organized unions and fomented strikes. For these latter activities, he was driven from one canton to another and finally out of Switzerland altogether. He returned to Italy in 1904 and entered the army to perform his compulsory military service. After his release in 1906, he returned to teaching, but he devoted much of his time and energy to politics. At this time he also did some writing, composing a few verses in the style of Corducci and producing a few novels; and he studied music, becoming quite adept at the violin. In 1908 he was arrested and put in jail for two days because of his connection with agrarian labor agitation in Romagna. Henceforth, he was regarded as a revolutionary and was watched by the police.

His restless spirit next carried him to Trent in *Italia Irredenta* (1909). There he became secretary of the Chamber of Labor and director of a socialist journal, *L'Avvenire*. Later he joined the great irredentist Cesare Battisti in the publication of *Il Popolo*. He was expelled from Austria for his irredentism and, upon his return, wrote *Trent as Seen by a Socialist* for *La Voce* at Florence. He then gave himself up entirely to socialist agitation at Forlì and became well known throughout the province for his

revolutionary activity. He had by now come under the influence of the French syndicalists—Blanqui, Prudhon and Georges Sorel. In 1911, he stirred the mob at Forlì to demonstrate against the Italian expedition to Tripoli, and for this anti-imperialist gesture he was imprisoned for five months. In 1912, he appeared at the socialist national congress and vituperated against the socialist parliamentary group because it temporized with bourgeois parties. This act brought him to the fore. He was influential in purging the party of some of its milder elements and he was made editor of the socialist paper, the *Avanti*. His experience in socialist circles made him pessimistic concerning democracy and parliamentary government. He began to show evidence of approving dictatorial government.

Upon the outbreak of the World War, Mussolini opposed Italy's joining the Central Powers. His country's stand for neutrality, however, only satisfied him for a moment, and, in November 1914, he declared that Italy should join the Entente states. He believed that war would give Italy a chance to cover herself with glory and possibly would provide an opportunity for a revolution. For his militarism and his nationalism he was expelled from the Socialist party and consequently resigned as editor of the *Avanti*. By a great effort and with very little capital, he founded an organization of his own, *Il Popolo d'Italia*, which preached nationalism and revolution. In 1915, he organized his followers, who numbered about 150, into the Fascio d'Azione Rivoluzionaria (Club for Revolutionary Action). When Italy declared war, he entered the army. He became a corporal, fought in several encounters, and was finally wounded by the explosion of a trench mortar. After his recovery he returned to Milan—to his paper and to his Fascio.

Mussolini's nationalism had now reached tremendous heights. He directed his efforts against what he considered the feeble foreign policy of the government and the internationalism of the socialists. He reorganized his followers into the Fascio di Combattimento and prepared to use force, if necessary, to further his ideals. Support came to him from different social classes. There were super-patriots like himself who were free-lances socially; there were bourgeois who feared the socialist threat to their property; and there were socialists who wanted the revolution to be a national movement. This motley group fought the international socialists in 1919 and 1920, but they were not entirely responsible for the failure of factory occupations. These did not succeed because of the workers' inability to get credit for the purchase of raw materials.

The organization of the Fascist Party took place under Mussolini's guidance in 1919. In the elections of 1921, it presented a common list of candidates with the Nationalist Party, and, on account of the numerical support of its ally, succeeded in electing 35 deputies, among whom was Benito Mussolini. Mussolini's dissatisfaction with parliamentary action was soon apparent, and, in 1922, after a succession of cabinet

changes and an increase in the impotency of the government to conduct the affairs of state, he led his forces, dressed in black shirts—a dress that had been worn by Mazzini as a symbol of mourning for *Italia Irredenta*—to Rome. The feeble ministry of Facta was pushed aside and Mussolini was made prime minister and virtual dictator.

Since that time, Mussolini has directed the affairs of Italy, developed and strengthened Fascism and built the Fascist state. He succeeded in establishing the unquestioned sway of the Fascists between the years 1922 and 1925. He crushed other political parties and organizations by force. Several attempts were made on his life in these early years, but he escaped on each occasion. Since 1922, he has been converted to Catholicism, which he lauds because it is national. He was largely responsible for the accord between church and state signed in 1929. His entire policy has aimed at strengthening the power of Italy—politically, economically, and culturally. S. B. C.

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**MUSTAGH**, a range of mountains in India, that part of the Himalayas which lies west of the Indus and extends to the Gilgit valley. The Mustagh and Hindu Kush ranges are different sections of the same crustal fold. The fold traverses western Tibet from southeast to northwest, curves round through Hunza and Gilgit, passes north of Chitral and enters Afghanistan in a direction from northeast to southwest. The eastern portion of the fold is known as the Mustagh range, the western as the Hindu Kush. The Shyok, Hunza, Gilgit and Kunar rivers drain the trough behind the Mustagh range; the Nubra rises in the Mustagh, the glacier at its source having cut a notch in the crest-zone. The Mustagh is a more arid and less wooded region than the Himalaya; its topographical features are consequently different. Rain water runs off more rapidly, sinks less below the surface, and the rocks are not protected to the same extent against variations of temperature by a mantle of verdure. The highest elevations occur in the section between the Karakorum Pass and the Gilgit valley, where the Dapsang (28,000 ft.) and the peak long marked K<sub>2</sub> on the Indian survey maps and now named Godwin-Austen after its first explorer (28,278 ft.), are, next to Mt. Everest, the highest peaks in the world. The general direction of the Mustagh from northwest to southeast is maintained at a mean elevation of 18,000 to 19,000 ft. for some distance beyond the Karakorum Pass, after which it takes a southward trend, and again rises to imposing heights along the southern edge of the Tibetan plateau.

**MUSTAPHA KEMAL PASHA** (1880- ). The great Turkish statesman and general, Kemal Pasha, was born at Salonika in 1880. To his given name "Mustapha" the title "Kemal" was added by one of his teachers in a military college. "Kemal" means perfection. Until the Young Turk movement of 1908

Mustapha was interested primarily in political agitation, but disappointed in the movement of 1908 he renounced politics for a military career. This career which was distinguished by his defense of the Straits against the British, was obscured by the struggles which accompanied the death agony of the old Turkish Empire. But in 1916 Mustapha Kemal used his position as General to organize the national Turkish resistance and to make himself master of the national Imperial Army. From that time on his fortune is inextricably interwoven with the overthrow of the ancient Turkish dynasty, the expulsion of the foreign foe from his country, and the remarkable transformation of a moribund Empire into a virile, progressive national state. In 1920 he was named President of the new National Assembly and in 1923 he was elected President of the new Republic. Despite bitter opposition to the dictatorial power which he wielded he was reelected President in the fall of 1927. Among the outstanding accomplishments of this man, whose services for Turkey might be compared to those of Peter the Great for Russia, we may mention his organization of the national defense against the Greeks, the drafting of the Treaty of Lausanne in 1923, the abolition of the Sultanate and the establishment of the Republic, the abolition of the Caliphate, and the sweeping introduction of Western ideas and practices into the most backward of Oriental countries.

L. G.

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**MUSTARD**, the name given to various species of *Brassica*, closely allied to the cabbage, some of which are grown for their seeds and as salad and forage plants. The black mustard (*B. nigra*), native to Europe and Asia and widely distributed in North America as a weed, is extensively grown in Europe for its seeds. The yellow powder made by grinding the seeds is the mustard of commerce and medicine. Other cultivated species are the white mustard (*B. alba*), used in Europe as a salad, as a forage crop and as a green manure, and the Sarepta mustard (*B. juncea*), native to southern Asia and widely naturalized in the United States, sometimes grown for its seeds. Mustard has been known as a table condiment since ancient times and Hippocrates used it in medicine. Applied externally in a plaster, mustard is a valuable rubefacient and counter-irritant; used internally in the proportion of a dram to a half ounce in a glass of warm water, it is an efficient emetic. Prepared mustard for table use, called also mustard dressing, is a mixture of ground mustard (mustard flour), salt, sugar, spices and vinegar.

**MUSTARD GAS**, a stifling, irritating gas used in warfare, chemical formula  $(\text{ClCH}_2\text{CH}_2)_2\text{S}$ . It was manufactured during the World War by two processes: (1) the action of chlorohydrin or sodium sulphide to form  $\beta\beta'$ -dihydroxy-diethyl sulphide, followed by the action of hydrochloric acid on this dihydroxy-compound to form the chloro-compound, and (2) by the direct union of  $\text{SCl}_2$  and ethylene.

The first process was the German procedure as well as that first used by the English, but the Allies soon changed to the second process.

As a liquid it is a pale yellow oil of characteristic odor, freezing point  $0^\circ \text{C}$ . and boiling point  $217^\circ \text{C}$ . Extremely poisonous under any and all conditions of contact with the animal body, it produces strong vesicating action which could cause death. It may be oxidized to a sulphoxide and then to a sulphone, the chlorine atoms may be replaced by other groups as  $\text{OH}$ ,  $\text{SO}_3\text{H}$ ,  $\text{NH}_2$ , by a suitable reagent. Also the chlorine atoms may be replaced by divalent groups to close the ring of atoms. See also **CHEMICAL WARFARE; GASES AND ATMOSPHERES, INJURIOUS**. E. C. BR.

**MUSTARD OILS**. The true mustard oils are obtained from the seeds of the mustard. Since there are several botanical varieties, the oil varies according to the seeds of the species used. The oil occurs in the seed as a glucoside, i.e., it is chemically combined with glucose. This glucoside reacts with water in the presence of a ferment also present in the seed to give glucose and oil of mustard. The oil can then be separated by steam distillation. In condensing the steam, the oil separates. The chief constituent of mustard oil is chemically known as allylisothioyanate. Several other related and analogous bodies are also found in the oil and their chemical natures vary according to the species of seeds from which the oil is derived. These bodies all contain nitrogen and sulphur. Mustard oil has a limited use in pharmacy. It is also made synthetically.

E. H. B.

**MUTANABBI** (c. 905-965), Arabian poet, was born at Kufa, about 905. His name has the meaning of "Would-Be-Prophet" and probably indicates some early messianic attempt. His student years were passed in Syria and his later life in Egypt and Persia. Mutanabbi's *diwan* of 300 poems is characterized by patriotic fervor and a florid style. As court poet, he sings of war and the mighty exploits of his royal protectors. Reputed the last great Arabic poet, Mutanabbi was murdered by Bedouins while traveling to Kufa in 965.

**MUTATION**, in biology, a discontinuous hereditary change. Many naturalists use the term in the sense of a sport or prominent hereditary variation, but most biologists to-day restrict the term to a change in one of the hereditary units, or genes. Some palaeontologists speak of the mutations of Waagen meaning an orthogenetic change. Hugo de Vries was one of the first to consider discontinuous variation as the sole method of evolution. The mutations of de Vries in contrast to those of Waagen are discontinuous saltations in many directions.

Modern discoveries in genetics and cytology are revealing that gene mutation is the primary method of evolution. It is realized that most of the small as well as the large hereditary differences between individuals of a species have been produced by gene mutation. This ultramicroscopic change in the germ cells is therefore responsible for many of the gradual evolutionary changes which become very familiar to



naturalists who trace the evolution of animals or plants.

One of the earliest known mutations was that of the short-legged Ancon sheep which appeared spontaneously in Massachusetts in 1791. Hornless cattle, tailless dogs and cats and albino rats are all definitely known to owe their distinctive characters to mutations. More than 400 mutations have originated in the fruit-fly *Drosophila*, in which and in other animals and plants they have been induced by X-ray and radium treatment. See ORGANIC EVOLUTION; GENETICS.

G. K. N.

**MUTE**, in music, a device affixed to an instrument so that the normal tone is both diminished in volume and altered in tonal color. In stringed instruments, such as the violin, it is a metal comb-like contrivance affixed to the bridge and interfering with the transmission of vibrations to the sounding-board, thus giving rise to a muffled and ethereal tone. In brass wind-instruments, such as the trumpet, it is a cone-shaped piece of wood inserted in the "bell" whence the tone exits. In the snare-drum, it is a piece of cloth laid between the snares and the drum-head. The Italian synonym is *sordino*. *Con sordini* (with mutes) is the phrase directing the use of mutes.

**MUTILATION**, the practice of artificially amputating or in some way deforming the human body. Mutilation has been practiced since earliest times, as is evidenced by paintings found in the cave of Gargas, Hautes-Pyrénées, France, representing hands with portions of fingers missing. It is now practiced among both primitive and civilized peoples. Common forms of mutilation include filing, chipping and removing teeth, enlarging the lobes of the ears, and piercing the alae and septum of the nose and the upper and lower lip for the insertion of wooden plugs and other ornaments. Some tribes change the shape of the head, making it long and pointed or flattening it. Skull deformation is almost universally accomplished by bandaging and tying boards to the heads of infants and small children. Putting out eyes and cutting the tongue were once legal forms of punishment in Europe.

**MUTTON**, the flesh of sheep more than one year old. The cuts from a side of mutton are the same as cuts of lamb. See also LAMB.

**MUTUAL IRRIGATION COMPANIES**, private, voluntary associations of water users organized for the construction, acquisition and operation of irrigation systems. Many have originated in connection with land-development enterprises. They are admirably adapted to operation purposes; their distinctive feature is service rendered at cost to the lands of members only. The more important companies are incorporated. Shares of stock carry the right to receive water and, under certain circumstances, are made appurtenant to the stockholder's land. Some mutual irrigation companies have issued bonds which are liens against the irrigation works and other corporate assets, rather than against the lands served. See also IRRIGATION.

W. A. H.

**MYCENAE**, an ancient city of Greece in the Argolic Plain in the Peloponnesus, which owed its importance chiefly to its position commanding the passes leading west to Corinth. It was the legendary capital of Agamemnon, and also the background of the sanguinary tragedies of the house of Atreus. The city maintained partial independence during the Persian wars, and in the 5th century B.C. Mycenae was a member of the Spartan League. In 463 B.C. it was besieged by the Argives, who razed the city, although the great Cyclopean wall and other parts of the citadel were left standing. Thereafter Mycenae was the rural center of a pastoral community, occasionally visited by scholars and tourists.

Until the late 19th century the chief attraction of Mycenae was the grave of Agamemnon and his household. In 1873 it was visited by Heinrich Schliemann, the German archaeologist, whose surface examination promised a rich yield to excavators. Accordingly he returned in 1876 with equipment and plans, and the same year unearthed the five celebrated shaft graves, hewn in the rock. These graves of a line of dynastic rulers, corresponding to the 18th dynasty of Egypt, are located inside the enclosure guarded by the famous Lion Gate. Discoveries since those of Schliemann include the ruins of a palace, the Treasury of Atreus, the Beehive Tombs, and a quantity of gold and silver work. Such examples date from the pre-Hellenic period, and gave birth to the name Mycenaean, to denote the civilization they represented.

**MYCORHIZA**, a morphological union between the mycelium of a fungus and the root of a plant; also used in the abstract sense to denote a form of symbiotic relationship between roots and fungi. Mycorrhizae occur in a great number of plants, especially in those growing in soil rich in humus; they are especially characteristic of forest trees, of orchids and heaths, and of plants wholly or partly devoid of chlorophyll, such as Indian pipe (*Monotropa*) and various species of *Burmanniaceae* and *Gentianaceae*. They also occur in many shrubs and herbaceous plants. In ectotrophic mycorrhizae, characteristic of forest trees, the mycelium forms a definite layer enveloping the root and ramifying between the cortical cells; the fungi concerned are known in certain cases to be species of mushrooms. In endotrophic mycorrhizae, as those of orchids, the external layer is absent or less prominent and the mycelium actually enters the cells of the root. In the heather and probably also other members of the heath family, the mycelium extends through all parts of the plant and even to the seeds, so that the mycorrhizal condition is continuous from one generation to the next. The exact role of mycorrhizae in the economy of the plant is not known, but they are probably connected in some way with absorption. Development of orchids from seed in artificial culture may be favored by early infection of the embryo with the mycorrhizal fungus, apparently through its activity in changing starch into sugar. The term is used by some authors to designate the fungus of the union, the term meaning

"root-fungus"; by others in a more strict etymological sense (fungus-root) to designate the root itself which is in union with the fungus. H. A. G.

**MYELITIS**, a term in general applied specifically to inflammation of the spinal cord. This inflammation may follow exposure to cold, a chronic type being caused by syphilis. It may be due to pressure such as in disease of the bones of the spinal column, in tumors, or injuries, such as fracture of the spine. It may rarely follow influenza, gonorrhea and measles. It is present in infantile paralysis.

Various clinical types are described, such as acute transverse myelitis and acute diffuse or ascending myelitis. The symptoms of the *acute transverse* type depend upon the part of the spinal cord involved. Sensory disturbances and paralysis are present. General symptoms, such as fever, are usually slight or absent. If the middle part of the spinal cord, known as the dorsal segment, is infected, there is paralysis of the lower limbs, loss of the sensation of pain and touch. At first, the deeper reflexes are lessened and later become more active.

In the *ascending* or *diffuse* type of myelitis, there is also paralysis and loss of the sensation of touch affecting the lower part of the body and gradually progressing upward. Fever and other general symptoms are present from the onset of the disorder. In this type, death occurs within five to ten days. It is probably due to infection.

In the transverse type, the treatment consists of rest in bed, keeping the skin dry and clean. After the acute stage passes, in from ten to fourteen days, the individual should be encouraged to move the limbs and hot water baths are given. W. I. F.

**MYLAE, BATTLE OF** (260 B.C.), a naval battle which resulted in a Roman victory over Carthage. When the First Punic War began, the contestants were evenly matched, save that Rome had no navy. At length a Punic ship washed aground was used as a model, and a new device added, a plank revolving around a pole at the prow, for boarding enemy ships. A fleet so prepared met a contemptuous Carthaginian armada of 130 sail off Mylae, Sicily, boarded and sank the first 30 ships, and pursuing the rest, destroyed 20 more.

**MYOPIA.** See AMETROPIA; BLINDNESS, MEDICAL ASPECTS OF.

**MYOSITIS**, or muscular rheumatism, is an inflammatory condition of the muscles, manifested by stiffness and pain. It may be acute or chronic, and in the acute form may be precipitated by overexercise of the muscle, resulting in sharp pain, stiffness or loss of function of the part. Chronic myositis may be due to the same causes as ARTHRITIS, such as focal infections (as tonsillitis or abscessed teeth), exposure or faulty function of the gastro-intestinal tract. Acute myositis is usually relieved by rest with application of heat and massage of the muscle. Chronic myositis is best treated by search for and removal of cause (as the focal infection), correction of faulty body posture, rest, a properly balanced diet, physical therapy to

the parts involved and the slow resumption of exercise.

**MYRMIDONS**, a race of ants turned into men by ZEUS and inhabiting Thessaly. (See AEACUS.) They followed ACHILLES so faithfully and fought so fiercely that the term myrmidons is applied to those who execute the orders of their superiors without question.

**MYRON**, one of the three great sculptors of the age of Pericles in Athens in the 5th century B.C. His works, chiefly in bronze, were numerous and varied, including gods, heroes, athletes and animals, and were praised by ancient critics for their force, poise and life-likeness. None of his originals survive. But we have late copies of his DISCOBOLUS and his MARSYAS. His bronze *Cow on the Market-place at Athens* was celebrated by Greek writers in 36 extant epigrams.

**MYRRH**, a bitter aromatic gum resin used in medicine as a tonic and also in perfumery. True myrrh is obtained from *Commiphora Myrrha*, a spiny shrub of the bursera family, native to Abyssinia and Arabia. Other resins called myrrh are obtained from closely allied species. The myrrh of the Bible is believed to have been a mixture of true myrrh and labdanum. The sweet cicely (*Myrrhis odorata*) of Europe, a highly fragrant herb of the parsley family cultivated for its pleasing odor, is also known as myrrh.

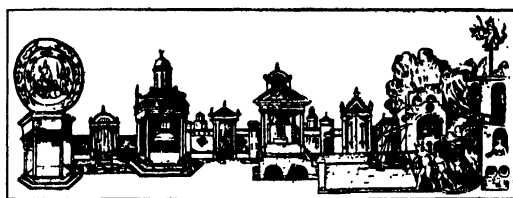
**MYRTLE** (*Myrtus communis*), a strong-scented evergreen shrub of the myrtle family highly prized since ancient times as an ornamental. It is a native of western Asia and the Mediterranean region, widely cultivated in gardens in mild regions and as a greenhouse plant in the north. The shrub grows from 3 to 10 ft. high, bearing oblong or lance-shaped shining leaves, white or rose-tinted flowers and bluish-black berries. Various parts of the plant are used as a condiment and also in making perfumes. The wood, which is sometimes handsomely mottled, is used in turnery. In the United States the common periwinkle (*Vinca minor*) and the California laurel (*Umbellularia californica*) are often called myrtle.

**MYSORE**, the capital of the State of Mysore, India, 10 mi. southwest of Seringapatam and 250 mi. southwest of Madras. The city forms a pleasant aggregate of regular streets, avenues, gardens and temples, the whole commanded by a strong fort constructed from European design. This stronghold, which is separated by an esplanade from the city, contains the rajah's palace, besides the dwellings of many wealthy citizens and other private buildings. The British Residency lies about 5 mi. farther south on the summit of Mysore Hill, 1,050 ft. above sea level. Leading manufactures are carpets and silk. Pop. 1921, 83,951.

**MYSTERIES**, originally, special secret religious rites practiced by the ancient Greeks; later, certain sacramental rites in the Christian religion, as the eucharistic elements or certain incidents in the life of Christ; and generally, any rites, as in freemasonry, known only to the initiated. Of the ancient Greek mysteries the most important were the Eleusinian and

the Orphic. The Eleusinian mysteries, celebrated each September at Eleusis, were elaborate rites in honor of DEMETER: the initiated received assurance of Demeter's divine protection during life and after death. The Orphic mysteries became prominent in Greece in the 6th century B.C. and were later incorporated in the Dionysiac religion; the initiation included purification with blood and the chanting of hymns attributed to ORPHEUS.

**MYSTERY or MIRACLE PLAYS**, medieval religious dramas, founded upon and presenting dramatically some part or parts of the Biblical narrative. They evolved from church ritual, especially from the Christmas and Easter rituals in which elaborate sym-



THE VALENCIENNES MYSTERY PLAY  
From a medieval manuscript

bolical acts, quasi-dramatic dialogue, music and special costumes were generously employed. The French clergy were performing dramas in their churches at least as early as the 12th century.

In the beginning of the 13th century these performances, now forbidden in the churches, began to be presented in public squares and streets by laymen on movable stages or platforms. In England the trade guilds arranged the productions, and in France local societies, the *Confrères de la Passion*, assumed control. The plays, given at Christmas, Easter and Corpus Christi Day, were held under lay auspices and were enlivened by new devices, new ideas on costume and staging, and by the introduction of comic or farcical elements. Separate plays were welded by the English guilds into complete cycles, covering the entire Biblical story from Creation to Doomsday. The texts of four such cycles of the 14th, 15th and 16th centuries still exist: the York cycle consisting of 48 plays, the Towneley, 32, Chester, 25, and the Coventry, 42 plays.

The mystery play died in the 16th century in England (see INTERLUDE; DRAMA), but existed somewhat longer on the Continent. The Oberammergau "Passion Play" is a survival. See also ENGLISH, FRENCH DRAMA.

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**MYSTERY STORY**, a type of narrative which concentrates attention upon the ultimate solution of a chain of problems concerned with riddles, ghosts, or extraordinary crimes. Poe's *Gold Bug* is a typical riddle story. Excellent ghost stories are de Maupassant's *Horla* and Poe's *Fall of the House of Usher*.

The amazingly popular detective story, which originated almost simultaneously in the United States (with EDGAR ALLAN POE, 1809-49) and France (with Émile Gaboriau, 1833-73), has examples in Wilkie Collins's *Moonstone*, 1868, and Dickens's *Edwin Drood*, 1870, and found perhaps one of its greatest masters in Sir Arthur Conan Doyle, creator of SHERLOCK HOLMES.

**MYSTICISM**, a striving for immediate union and contact with God. The mystic longs for such union, and by developing a technique, is able to attain such ecstasy that he feels he has actually achieved such union. Mysticism has a language of its own. To the outsider it is somewhat unintelligible, but to the mystic it describes the indescribable and symbolizes an experience that is supremely valuable and supremely real.

Oriental religions are noted for their mysticism. This is true of Brahmanism in particular, and the Hindu Yoga is one of the best expressions of it to-day. Christianity has also had its famous mystics, such as Suso and St. Teresa. In philosophy, there is a mystical element in PLATO's contemplation of the Ideas, and in Neo-Platonism this quality is best brought out in the doctrines of PLOTINUS. The Stoic conception of the world soul is also somewhat mystical, as is its more modern expression in the Emersonian OVERSOUL. The striving for communion with the Absolute, as expressed in romantic idealism, is a mystical longing giving rise to philosophic systems. The idea of intuition held by HENRI BERGSON also reveals a mystical element.

Much interesting work has been done in the psychological approach to mysticism, in the attempt to develop, in recent years, a scientific psychology of religion.

**MYSTIC SHRINE, ANCIENT ARABIC ORDER OF NOBLES OF THE**, an American order for Masons of the 32nd degree in the Ancient and Accepted Scottish Rite, or for Knights Templars. The society, however, has no formal association with the Masonic fraternity. Its name is derived from an order, reputedly founded at Mecca, Arabia, in the year of the Hejira 25, but the modern organization was not established until 1871. Members, called "nobles," wear the fez, claws, scimitar and star peculiar to the society, whose aims are chiefly social. In 1930 the membership was approximately 576,193.

**MYTH**, an imaginary tale usually connected with some hero, god, or natural phenomenon. All early peoples have their myths and even modern nations are not entirely free from mythical and legendary folklore. The myth is a part of tradition, being handed down from generation to generation. In it the imagination is free to dwell upon events not met with in everyday life. Best known among the myths are those of Greece and Rome. Ulysses, Æneas, Achilles, Atlas, Ceres, Venus, Juno and Apollo are all well-known mythological characters. Most of the planets, the days of the week, and the months of the year have derived their names from mythology.

**MYTHOLOGY**, an organized body of myths, stories, fables or legends that has grown up around nature, heroes or the gods. All peoples have their mythology. The origins of these tales are lost in tradition. Chief among such mythologies are the classical, the Norse and Teutonic and the Indian.

Classical mythology has reference to the myths of Greece and Rome. Although there was a native Tuscan mythology, the Roman mythology was borrowed largely from that of the Greek. Thus there is a close resemblance between the Roman and the Greek pantheons. The sources for Greek mythology are the great epics of Homer and Hesiod, the Orphic poetry and the poet Pindar. For the Roman the poets Virgil and Ovid and the historian Livy are the chief sources. History bears many testimonies as to the nature of classical mythology in the way of shrines, cults, statuary and other forms of art. Mythology is closely connected with religion, especially POLYTHEISM.

The Norse and Teutonic mythologies are closely related to each other; in fact they are frequently known as the Eddic mythology. Although names and stories, gods and heroes frequently had a local coloring or variation, in large outline the mythology of all Teutonic peoples is much the same. Apparently the stories had their origin either in Norway or Iceland; probably both countries contributed. These myths were not collected, however, until nearly 2,000 years after the time of Homer and Hesiod. Consequently the people themselves had largely outgrown the beliefs found in the Eddas. The Elder or Poetic Edda is known as *Saemund's Edda* and the Younger or Prose Edda as *Snorri's Edda*.

Indian mythology is unusual in that it is probably the most ancient and certainly the most enduring of all mythologies. Many of its beliefs are still widely held in the prevailing Hinduism of to-day. The

sources of this great mythological body of belief are parallel with the sacred literature of the country. The oldest of these is the *Rigveda*, which goes back at least as far as 1500 B.C. Then there are the *Brahmanas*, the *Puranas*, the contributions of Buddhism and Jainism and those of modern Hinduism, which enter into this development.

**MYTILENE.** See MITILENE.

**MYXEDEMA.** The secretion of the THYROID GLAND acts as a regulator of the rapidity with which the chemical processes in the body occur. Lack of this secretion in infants and children causes CRETINISM, and in adults produces myxedema. Myxedema may result from any disorder that affects the thyroid gland and destroys its glandular tissue. The gland, fortunately, is not susceptible to many such destructive agencies, so the disease is comparatively rare. It occurs most often between the ages of thirty and fifty.

Deficient secretion causes a slowing down of the body processes or metabolism, a lowered body temperature, and an increase in weight, with a loss of strength and mental inactivity. There accumulates under the skin a peculiar mucoid substance, from which the disorder derives its name. It is not watery as in ordinary edema or dropsy, but the skin is elastic and a depression is not left following pressure upon it. The face is swollen and the expression of the individual changes. The skin is dry and rough and the hair dry and sparse. Memory is defective. Constipation and anemia are usually present.

The symptoms may occur in a mild degree in women between the ages of forty and sixty years, and clear up rapidly under treatment. The most efficacious treatment is thyroid gland preparations, the dose being regulated by the response of the disorder to it.

W. I. F.

## N

**NABATAEAN**, an extinct SEMITIC language of the West ARAMAIC group preserved in inscriptions found in North Arabia, the Hauran, and the Sinaitic Peninsula (100 B.C.-500 A.D.). By race and speech, the Nabataeans were Arabs, but in writing they employed this Aramaic dialect interspersed with a number of Arabic words, grammatical forms, and proper names.

**NABUCO DE ARAUJO, JOAQUIN AURELIO** (1849-1910), Brazilian diplomat and writer. He occupied high positions in the diplomatic corps, being sent as minister plenipotentiary to London, and ambassador to Washington. When the question of the limits of British Guiana were submitted to the king of Italy for arbitration, Nabuco de Araujo was appointed head of the Brazilian commission. He was a fervent partisan of the abolition of slavery, a successful orator and newspaper man, and the merits of his articles in *O Paiz* of Rio de Janeiro were widely recognized in Brazil. His 17 volumes on the delimitations of British Guiana were translated into French, and other of his writings were read abroad. Among his most important works are *O abolicionismo* (1873); *O partido ultramontano* (1873); *Balmaceda e la guerra civil do Chile* (1895). He died in 1910.

**NACOGDOCHES**, a city in eastern Texas, the county seat of Nacogdoches Co. It is situated 130 mi. northeast of Houston and is served by three railroads. The city is surrounded by fertile agricultural and stock-raising country. The leading local manufactures are cotton and cottonseed products, soda water and hair tonic. Lumbering is an important interest of the vicinity. Stephen F. Austin State Teachers' College is located here. A Spanish mission was established on this site in the early part of the 18th century. The settlement of Nacogdoches was a scene in the struggle of America and Spain for the possession of this southwestern territory and in 1812 was captured by the Americans. Old Stone Fort and the Aqua Vitae Mineral Wells are of interest. Pop. 1920, 3,546; 1930, 5,687.

**NADELMAN, ELIE** (1885- ), Polish sculptor, was born at Warsaw, Poland, Oct. 6, 1885. He studied in the art schools in Poland and Paris and came to the United States after the World War. Here his presence in the world of modern sculpture was immediately felt. Nadelman exhibited *The Adolescent* at the Pennsylvania Academy of Fine Arts in 1921. He is best known for his modern versions of classic sculpture in which he combines wit with an original conception of form.

**NADIR**, the point on the celestial sphere directly underneath the observer.

**NAGASAKI**, a Japanese seaport in Nagasaki Ken, situated in the northwest part of Kyushu Island.

Chief city of this subsidiary of the main island, Honshu, Nagasaki has a harbor which has been called one of the most beautiful in the world. Hills stand behind it and Takashima Island, noted in Japan for its colliery, lies 8 mi. off the entrance. First opened to trade in the 16th century, Nagasaki was one of the oldest wedges for commerce into Japan. Prior to 1854 it was the only Japanese port accessible to foreigners, one Dutch ship a year being permitted to visit the island during the 200 years of Japan's self-isolation. Its chief exports include silk, porcelain, imitation pearls, tortoise-shell ware, cloisonné, ivory, fans, screens, curios and toys. It is the first port of call of most westward steamers from Europe, the Indies, the South Seas and China. Railroad connections, for which it is the terminus, add to its trade. The Nagasaki main line, branching off from Tosu on the Kagoshima railroad, ends at the port.

Within the vicinity of Nagasaki are Unzen Spa, a favorite resort for foreign colonists from Chinese ports; Suwa Shrine, built on a hill among the pines and camphor trees on the outskirts of Nagasaki; and picturesque Mogi, 5 mi. away. Pop. 1930, 204,626.

**NAGOYA**, a manufacturing city of Japan, situated on the island of Honshu. It faces Ise Bay and lies in the southern part of a fertile plain midway between Osaka and Tokyo. Thoroughly modernized, Nagoya has waterworks and street tramways. The local products are lacquer, cloisonné, silks, fans and porcelain, which are exported as well as sold in the thriving city shops. Nagoya came into Japanese history in the 14th century, but the days of its affluence date back to 1610 when Tokugawa Ieyasu built the feudal castle, the most famous of its type in Japan and noted for the golden dolphin surmounting the donjon. A peaceful moat surrounds the structure and numerous paintings decorate the walls. One of the rooms was so built that it betrayed any approach, and gave a sense of security to the early rulers. In the city is also situated Atsuta Jingu, the second greatest shrine in Japan, sacred because one of the three antique objects formed the imperial regalia. Among the temples is Higashi-Hongwan-ji, a Buddhist building with unusual beauty of structure. In the number of its citizens Nagoya is the third largest city in Japan. Pop. 1930, 907,404.

**NAGPUR**, the capital of the Central Provinces of India, and of the division of Nagpur (area 23,521 sq. mi.), situated almost midway between Bombay and Calcutta and on the borders of two great natural regions, the northwestern and northeastern plateau. The municipal area includes Sitabaldi Hill, where the British residency with a small cantonment is situated. There are other cantonments at Takli, 2 mi. distant, and at Kamphthi, the chief one,

9 mi. away. The local manufactures include cotton and woolen cloths, and utensils of copper and brass. There is a trade in opium and hemp. A bed of coal, estimated to contain 17,000,000 tons, was recently discovered near the city. Nagpur was formerly the seat of a line of rajahs the last of whom was displaced in 1853 by the British. Pop. 1921, city, 145,193; division, 3,728,063; 1931, city, 215,003; division, 3,955,578.

**NAHANE**, a group of Athapascan Indian tribes speaking a single dialect, inhabiting British Columbia and the Yukon Territory between the Coast Range and the Rocky Mountains between about 57° and about 65° N. lat. The Nahane include the Tahltan, Kaska and several other tribal groups. The more westerly Nahane groups have been greatly influenced culturally by their Tlingit neighbors, from whom they have adopted a clan organization, the potlatch and some vocabulary. They appear also to have a phratral system similar to that of the Tlingit. The easterly Nahane, on the other hand, are loosely organized into paternal bands like the other Northern Athapascans.

**NAHMANIDES, MOSES** (c. 1195-1270) (called also Nachman Gerundi, from his birthplace Gerona; also Ramban, an abbreviation formed from the initial letters of the four Hebrew words for Rabbi Moses ben Nahman), famous Jewish commentator on the Bible, rabbinical authority and author, was born in Gerona, Spain, about 1195. He became famous for his participation in the four-day religious disputation of 1263 in Barcelona against the baptized Jew and ardent missionary Pablo Christiani which was held at the instance of King Jaime I of Aragon. Because of the report on the actual occurrences of the disputation, which he made in order to give the lie to the false accounts of the anti-Jewish agitators, and because of his severe criticism of Christianity for its inconsistency in failing to practice the peaceful doctrines of Jesus, he was exiled from Aragon in 1267 by Pope Clement IV, at the implacable instigation of the Dominican friars. He went to Jerusalem, where he restored a synagogue which had been destroyed by the Mongols in 1260, and succeeded in forming a new Jewish community and establishing a new schoolhouse. Here he wrote his commentary on the Pentateuch, a work replete with Haggadic interpretations and Cabalistic allusions. He died at Acco, Palestine, in 1270.

**NAHOR**, according to the two traditions in the 11th chapter of the *BOOK OF GENESIS*, was the father of *TERAH* and grandfather of *ABRAHAM*, or the son of *Terah* and the brother of *Abraham*. While some scholars identify his name as an ethnological term, others think he was an early Aramaean deity, whose legends became mixed with those of *Abraham*. We also read (*Genesis* 24:10; 31:53) of "the city of *Nahor*" and "the God of *Nahor*." *Til-Nahiri* in Mesopotamia may be a survival from *Nahor*.

**NAHUM, BOOK OF**, the seventh of the minor prophetic books of the Old Testament, is named

after a Hebrew prophet, native of a place called *Elkosh*, of which we have no information. It is generally believed to represent an authorship between 664 and 606 B.C.; but many modern scholars see in parts of the work the writing of a post-exilic author. God is set forth as a jealous and avenging deity, and in the judgments prophesied against *Nineveh*, the prophet does not measure his language. On the other hand, to the Jews God is "slow to anger and of great mercy."

**NAIAD**, in classical mythology, one of the nymphs who lived in brooks, rivers and springs. They were found also in caves where there were trickling streams. As the waters in which the Naiads lived often had healing properties, the nymphs had votive offerings made to them. Prophecies too were sometimes delivered from these streams.

**NAILS**, oval, horny, flattened structures placed at the backs or upper surfaces of the finger-tips and in a like position on the tips of the toes. The nail is formed of the much thickened stratum lucidum of the *SKIN*. It is placed on the basal layer of the skin, which here is very rich in capillaries, giving a pink color to the nail. All or practically all of the growth of the nail takes place, however, at its basal portion or root. At this point the nail passes into a deep fold of the skin. The cells of the basal layer in this region are actively reproducing and becoming transformed into the elastic, horny substance of the nail.

Nails, hooves, and claws represent identical structures in various animals, modified, however, to fulfill special functions.

**NAILS**, long slender pieces of metal tapering to a point or pointed at one end, with a flat, round, button or other type of head. Common nails have flat heads, and may be barbed or smooth. Brads have small circular heads, and come in the same sizes as common nails. Most of the nails in ordinary use are made from steel wire, although copper, brass or other material is often used. Nails at one time were made by hand, but now automatic machines have been built, which cut the wire to the desired length and form the point and head.

**NAIROBI**, a city of British East Africa, capital of *KENYA* Colony, lying 330 mi. by rail northwest of *Mombasa*, the principal port of the colony. Besides being the administrative center of *Kenya*, *Nairobi* is the headquarters of the *Uganda Railway* and the seat of the principal European business branches. It contains an Anglican cathedral, several noteworthy monuments and a museum of natural history. There is a brisk trade in wheat, maize, sesal oil, coffee, wool and dairy produce. Pop. 1929, 51,599.

**NAJARA, ISRAEL** (1555-1628), Hebrew lyrical poet, Cabalist and rabbinical scholar, was born at *Safed*, *Palestine* (according to some, *Damascus*, *Syria*), in 1555. He died at *Gaza* in 1628, where he served as rabbi during the last few years of his life.

Some of *Najara's* lyrical poems were secular and erotic, and some religious. In the latter, following the principles of the Cabalist *ISAAC LURIA*, he gave

expression to the mystic longing to be at one with the divine. His poetry, not of any great original value, is notable because of its euphoniousness of diction and smoothness of style. His secular poems indicate that he possessed a good knowledge of Turkish, Spanish and modern Greek. One hundred and eight of his poems were printed at Safed in 1586, under the title *Zemiroth Israel*, or *Songs of Israel*. Other collections were published at later dates.

**BIBLIOGRAPHY.**—*Revue des Études Juives*, vol. 58, pp. 241-69; vol. 59, pp. 96-105, 231-38; *Jüdische Zeitschrift*, vol. 9, pp. 275-82.

**NAMBE**, a pueblo and tribe of the Tanoan linguistic stock. The pueblo is situated on the Nambe River, about 16 mi. north of Santa Fe, N.M.

**NAMPA**, a city in southwestern Idaho, in Canyon Co., situated near Snake River, 20 mi. west of Boise. It is served by the Oregon Short Line of the Union Pacific Railroad. Nampa is a market for a wide timber and irrigated farming region, producing vegetables, apples, live stock, honey and certified seed. The city has packing plants, creameries, condensed milk factories, a chicken hatchery and an apiary supply plant. Many of these establishments derive their hydro-electric power from Snake River. Nampa is built on the old Oregon Trail. Pop. 1920, 7,621; 1930, 8,206.

**NAMUR** (Flemish *Namen*), capital of the Belgian province of the same name, is located on the Meuse River at its juncture with the Sambre. Namur is a busy industrial city. Heavy trade is facilitated by the river shipping and by 5 railroads. Principal products are machinery, fine steel cutlery, earthenware and glassware. The fortified city has wide streets, attractive promenades and large public squares. Among the numerous churches most noteworthy are the Cathedral of St. Aubin, 1750-72, with the grave of Don Juan of Austria, the splendid church built by the Jesuits, 1621-54, and Notre Dame, remarkable for its great size and fine proportions. Other buildings include an 11th century belfry, the Palace of Justice, a former monastery, the city hall, the theater and the Hospice d'Harskamp. Large fairs and cattle markets are frequent. It has an episcopal seminary, an athenaeum, a comprehensive archeological museum, various learned societies and charitable institutions and is the seat of a governor and of a bishop. In medieval times the city was the capital of a county of the same name and was several times captured by the French. Pop. 1930, 30,389.

**NANAIMO**, a city situated on the Strait of Georgia, on the east coast of Vancouver Island, British Columbia, Canada, 74 mi. north of Victoria. The good, natural harbor accommodates a large traffic in coal from neighboring mines, cured herring of local fisheries, and the produce of fruit, poultry and dairy farms of the environs. Sawmills, breweries and canneries are among the numerous manufactures. Pop. including suburbs, 1921, 6,559; 1931, 6,745.

**NANCY**, an important city of northeastern France capital of the department of Meurthe-et-Moselle. In

1737 Stanislas Leczinski, dethroned king of Poland and last of the Dukes of Lorraine, established a brilliant court here and embellished the city with the handsome 18th century buildings which remain its greatest architectural pride. Nancy is one of the best built cities of France. The duchy was united to France after Stanislas's death. Nancy received a great influx of immigration from Alsace-Lorraine after 1870-71, and its industries which are widely varied became more prosperous than ever. During the World War, although bombarded, it was not invaded nor badly damaged. Pop. 1931, 120,578.

**NANKING**, also known as Kiang-ning, the capital of Kiangsu province, China. Situated on the Yangtze River, about 200 mi. from the mouth, it can be reached by ocean steamers and thus constitutes an important import and export city for China. The present city has been known since the 14th century although cities had been constructed on the site as early as the 4th or 5th century B.C. After its capture by the Taiping rebels in 1853, most of the city's handsome edifices and monuments were destroyed. The Chinese government opened Nanking to foreign trade in 1899. The principal manufactures are textiles, paper and pottery. Pop., 1929, 522,696.

**NANNING**, a port of Kwangsi province, China, situated on the Tso River, a branch of the long West River carrying trade from the southern coast of China to the interior. A part of the city has been improved by the natives, bounded and criss-crossed with macadamized roads. The chief exports are agricultural products, aniseed and antimony, furnished particularly for European demand during the World War. Foreign trade was opened in 1907. Pop. 1929, 73,412.

**NANNYBERRY** (*Viburnum Lentago*), a shrub or small tree of the honeysuckle family, called also sheepberry and wild raisin, often cultivated for ornament. It is found in moist thickets and along streams from Quebec to Saskatchewan and south to Virginia and Colorado. It grows sometimes 30 ft. high with a short trunk and slender branches bearing ovate, long-pointed, sharply toothed leaves and very numerous white flowers in large broad clusters. The fruit, a sweet, juicy, black drupe with a flattened stone, ripening in September, often persists through the winter.

**NANSEN**, **FRIDTJOF** (1861-1930), Norwegian explorer and statesman, was born at Frøen, near Oslo (then Christiania), Oct. 10, 1861. He studied at the University of Oslo, specializing in zoology. In 1882, while a student, he made a trip to East Greenland waters on a sealing vessel to obtain zoological specimens. This whetted his interest in Arctic exploration, and he made several other expeditions. He was the first to cross the Greenland ice cap (1888) and he spent the winter of 1888-89 among Greenland Eskimos. The expedition which brought him world-wide fame was that of the *Fram* in 1893. The *Fram* was constructed to resist ice pressure, and the plan was to let the vessel become frozen in and drift with the ice. Nansen's investigations of Arctic currents had convinced

him that the ship would drift from above Siberia either across the Pole or very near to it. The ship reached 84° N. lat. (Mar. 14, 1895) and Nansen, with one companion, Lieut. Johansen, succeeded in reaching 86° 14', the highest latitude achieved up to that time. Nansen told the story of this expedition in his book, *Farthest North*. During the crisis between Norway and Sweden in 1905 Nansen took an active part in politics. He became Norway's Minister to England in 1906, but resigned two years later to become professor of oceanography at Oslo. After the World War, he took an active part in relief work in Russia. He became Norway's representative in the League of Nations and was awarded the Nobel Peace Prize for 1921-22. Nansen died at Oslo, May 13, 1930.

**NANTES, EDICT OF**, an edict issued by Henry IV of France in Apr. 1598 which secured for the French HUGUENOTS religious freedom and certain political privileges. Specifically, it prescribed the limits within which the Huguenots could hold public worship; permitted them to engage freely in commercial pursuits, to share in public office and to enter the universities; established courts for the settlement of disputes, and specified places of safety in case of attack, which they were permitted to fortify. This edict was revoked by Louis XIV in Oct. 1685. Its revocation led to extensive emigration on the part of the Huguenots to the Protestant countries of Europe and to the American colonies of South Carolina and Virginia.

**NANTES**, an important commercial port and industrial center located on the Loire estuary in western France, the largest city in Brittany and capital of the department of Loire-Inférieure. Sugar is one of the chief articles of commerce and sugar refining is among the town's chief industries. Other industries are the preparation of meat, fish and preserved food products. Shipbuilding and metallurgical industries also flourish. Nantes has an old castle, and a Gothic cathedral. It is famous historically as the scene in 1598 of the signature by Henri IV to the celebrated edict which assured Protestant liberties. During the World War Nantes was a British base. Pop. 1931, 187,343.

**NANTICOKE**, a North American Indian tribe and confederacy belonging to the Algonkian linguistic stock. They lived on the Nanticoke River in Maryland. Linguistically and culturally they were closely related to the Delaware and Conoy. In the 17th century they constantly harassed the Maryland settlements. In the next century some of the tribe began a northward migration and settled on the Susquehanna in southern New York, being protected by the Iroquois; the remainder stayed in Maryland. Later, the New York group, with the Mahican and Wappinger, migrated westward, joining the Delaware in Ohio and Indiana, thus losing their tribal identity. The Nanticoke appear to have been hunters and fishermen; they lived in fortified towns in bark houses; descent was in the female line; the chieftaincy was attainable by women as well as men.

**NANTICOKE**, a city of Luzerne Co., Pennsylvania, on the Susquehanna River, 8 mi. southwest of Wilkes-Barre; it is served by the Pennsylvania and, indirectly, by the Lackawanna railways, and for freight, by the Central of New Jersey. Anthracite mining is the chief industry, and manufactures, including silk yarn, stockings and cigars, are annually valued at \$4,800,000. In 1929 the factory output reached approximately \$5,000,000; the retail trade amounted to \$9,001,463. Nanticoke was founded in 1793; incorporated, 1874; incorporated as city, 1925. Pop. 1920, 22,614; 1930, 26,043; 29% foreign-born.

**NANTUCKET**, a town on the north shore of NANTUCKET ISLAND, in Nantucket Co., Mass., about 48 mi. southeast of New Bedford off the southeast coast of Massachusetts. Steamers to New Bedford and other ports provide transportation. Nantucket is a famous summer resort with a moderate climate due to its insular position. Cod, clams and scallops are shipped. Nantucket was first purchased in 1641 and settled in 1659. It was formerly noted as a whaling center. Pop. 1920, 2,797; 1930, 3,678.

**NANTUCKET ISLAND**, in the Atlantic Ocean off the southeastern coast of Massachusetts, about 30 mi. south of Cape Cod. The island is comparatively level, with picturesque bluffs and sand dunes. It is about 15 mi. long, with an average width of 2½ mi. Its climate, considerably moderated by its insular position, makes Nantucket extremely popular as a summer resort. Nantucket, with Martha's Vineyard, was purchased by Thomas Mayhew in 1641, and the first settlement was established in 1659. It was a principal seat of the whaling industry for more than a century. The island still retains its quaint distinctive Quaker atmosphere.

**NANTY GLO**, a borough of Cambria Co., southwestern Pennsylvania, situated 13 mi. north of Johnstown. It is served by two railroads, the Pennsylvania and the Cambria and Indiana. The chief industry of Nanty Glo is coal mining. Pop. 1920, 5,028; 1930, 5,598.

**NAPA**, a city in northwestern California, county seat of Napa Co., situated at the head of navigation on the Napa River, 46 mi. northeast of San Francisco. Bus and truck lines, steamboats and the Southern Pacific Railroad afford transportation. There are two private airports. Napa is a trade and industrial center in the Napa Valley, one of the richest regions in the world. Prunes, grapes, pears, alligator pears and grain are among the crops which grow in abundance. Oil, clay and quicksilver are found in the vicinity. The chief industries include the manufacture of gloves, shoes, paper boxes, dried fruit and grape juice. Angwin, 27 mi. northwest, is the seat of Union Pacific College.

Napa, founded in 1832, was incorporated in 1872 and reincorporated in 1915. Its fine climate and Napa Soda Springs and Calistoga Hot Springs in the vicinity have made the city a popular health resort. One of the chief spots of interest is the petrified forest at the foot of Mount St. Helena, an extinct volcano.



The Napa Valley figures in Robert Louis Stevenson's *Silverado Squatters*. Pop. 1920, 6,757; 1930, 6,437.

**NAPERVILLE**, a city in Du Page Co., north-eastern Illinois, situated 29 mi. west of Chicago. It is served by the Chicago, Burlington and Quincy Railroad. Naperville is the seat of North Central, formerly North-Western, College and of the Evangelical Theological Seminary. The city has furniture and bag factories, orchid greenhouses, nurseries and mushroom farms. Naperville was settled in 1831. Pop. 1920, 3,830; 1930, 5,118.

**NAPHTHA**, in general, any petroleum product lighter than kerosene, frequently used to denote a refined petroleum product intermediate between gasoline and kerosene. The properties of naphthas vary with the crude PETROLEUM from which they are obtained and with the purpose for which they are to be employed. Refined naphthas are used principally as solvents in the rubber, paint and varnish, and DRY CLEANING industries. Crude naphthas are utilized for the enrichment of manufactured gas.

**NAPHTHALENE**,  $C_{10}H_8$ , an aromatic hydrocarbon consisting of two benzene rings with two carbon atoms in common. The commercial supply is largely derived from the middle fraction of coal tar which distills in the neighborhood of  $200^{\circ}C$ , and which, after treatment with caustic alkali, is again distilled with steam. It is a white crystalline substance, slightly greasy to the touch, which is easily combustible, and burns brilliantly, though with a sooty, blackening flame. Naphthalene sublimes at all temperatures without leaving a residue, on which, together with the pungent odor of its vapor, is based its use as a disinfectant and a mild insecticide in the form of "moth balls" or powder. It is of great importance as a starting point for numerous coloring materials in the dye industry, via the naphthols, naphthoquinones, or phthalic acid as intermediaries, and is important in the form of its nitro-compounds for explosives.

**NAPHTHOLS**, organic compounds formed by replacing one of the hydrogen atoms in naphthalene by a hydroxyl group, and thus analogous to phenol, or hydroxybenzene. Depending upon the position of the hydroxyl group in the molecule, they are differentiated into alpha- and beta-naphthol; both are prepared by the action of fuming sulphuric acid upon naphthalene, and subsequent treatment of the sulphonic acid formed with caustic soda. Both are crystalline substances, alpha-naphthol having a slightly yellow color, beta-naphthol a violet tinge. Both are somewhat soluble in hot water, while the sulphuric acids of both, but especially that of beta-naphthol, are used extensively in the manufacture of dyes.

**NAPHTHYLAMINES**, amino-compounds of naphthalene, and, like the naphthols, distinguished into alpha- and beta-naphthylamine, according to the position of the amino-group in the molecule. Since naphthalene, upon nitration, yields almost exclusively alpha-nitro naphthalene, the corresponding amine is made by its reduction with nascent hydrogen while

the beta-amine is generally prepared from beta-naphthol. Especially the sulphonic acids derived from these amines are important in the manufacture of synthetic dyes, such as Congo-red, which contains two naphthalene nuclei, as well as two additional single benzene rings.

**NAPIER, SIR CHARLES JAMES** (1782-1853), English soldier, born in London, member of a prominent and distinguished family, began his military career under Gen. Fox in Ireland in 1803, served under Sir John Moore in Portugal and was captured at Corunna. Later he fought with Wellington in the Peninsular Campaign and at Waterloo. In 1841 he went to India, conquered the Sind and after the victory at Hyderabad in 1843 he became governor of the provinces until 1847. He returned to England in 1850 and died at Portsmouth, Aug. 29, 1853.

**NAPIER, JOHN** (1550-1617), Scottish mathematician and divine, was born at Merchiston, near Edinburgh, in 1550. After matriculating at St. Andrews he studied and traveled on the Continent. Early in his career he became active for the Protestant cause in politics, and was the author of *Plaine Discovery of the whole Revelation of Saint John set down in two treatise*, published in 1593, a classic in Scotch theological literature, and an influential work at that time. He is perhaps most famous as a supporter of the decimal system of mathematical notation and, as one of the independent inventors of logarithms, a table of which he gave to the world in 1614, in his *Canonis Descriptio*—although his methods of calculating them were not published until after his death. Napier died Apr. 4, 1617.

**NAPIER**, a seaport town of New Zealand, situated on the east coast of North Island, 200 mi. northeast of Wellington, with which it is connected by rail. Early in Feb. 1931, a terrific earthquake which swept the coast entirely destroyed this town, together with its neighbor, Hastings, pop. 12,000. The cathedral church of St. John, considered one of the best examples of ecclesiastical architecture in New Zealand, collapsed and buried the congregation. The harbor was altered beyond recognition. The earthquake entirely paralyzed the business of the community, which formerly exported wool, fruits and meats from the surrounding district. Before the earthquake, the population had been estimated at 16,200.

**NAPIER RODS**, a scheme for multiplying one number by another, suggested by the Arabic writers at least as early as the 13th century and printed in 1478, but improved by

JOHN NAPIER and described in his *Rabdologia* (1617). This book was printed in the year of Napier's death and attracted a great deal of attention. Napier's originality consisted in arranging the multiples of the various 1-figure integers on

3	4	1
5	2	4

NAPIER RODS

At the right is shown the 6-rod. At the left, the seventh row of the 5-, 6- and 2-rods placed side by side

6
6
1
2
1
8
2
4
3
0
3
6

rods as here shown, where the products  $1 \times 6$ ,  $2 \times 6$ ,  $3 \times 6$ ,  $4 \times 6$ , . . .  $9 \times 6$  are given in such a way as to allow the rods to be placed side by side and a product to be read off easily. For example, to find  $7 \times 562$ , the 5-, 6-, 2-rods would be placed side by side, and in the seventh row would appear as here shown, from which the product  $3, 5 + 4, 2 + 1, 4$ , or 3,934, is easily read. See CALCULATING MACHINES.

**NAPLES**, the chief city of southern Italy, and the country's second seaport. Built in a natural amphitheater above the curve of the lovely bay which opens into the Mediterranean, Naples has one of the most beautiful locations of all the world's cities. Mt. Vesuvius lies at one end of the bay, and the islands of Capri and Ischia are at its entrance. The harbor is dominated by the picturesque mass of the old Castel' dell 'Ovo, restored in the 16th century; the 16th century Castel' Sant' Elmo is a conspicuous feature in the city itself. Long notorious for its congestion, Naples has been much rebuilt and its living conditions greatly improved in recent years; the water supply is celebrated for its excellence; large sums of money have been appropriated for public works since the World War.

The architecture of Naples is not noteworthy, but the city has a number of well-planned streets, and an attractive park near the beautiful sea-front. The Museo Nazionale is one of the finest museums in Europe; its Greek and Roman collections are unique, and much space is devoted to Pompeian remains. Next to the museum the most important institution is the famous aquarium, with a fine and varied collection. The university of Naples was founded in 1224. Naples is built on the site of the Greek Parthenope, captured by the Romans in the 4th century B.C. Following four centuries of independence after the barbarian invasions, Naples became the capital of the medieval kingdom of the Two Sicilies, and played an important part in the rivalries of European powers. Although growing industrially, it has been' outstripped by Milan in population. Its principal manufactures, gloves, coral, tortoise-shell and macaroni, are connected with local products; the cotton and silk industries also flourish. Olives, grapes, fruits, and a fine quality of hemp are grown in the surrounding country. Pop. 1931, 839,390.

**NAPOLEON** (1769-1821), Emperor of France, and from 1799-1815 the central figure of European history, was born in Corsica, Aug. 15, 1769, of noble but impecunious parents. He was educated at Government expense in various French military schools, where his chief interest lay in mathematics, military history and military science. During the early years of the FRENCH REVOLUTION he cherished his youthful dream of fighting for Corsican independence; in 1792 he cast his lot with the French revolutionaries. Driven by ambition and supremely confident of his ability, he sought and found minor opportunities to advance himself in a revolutionary career. The events of Thermidor seriously compromised his future, but a fortunate accident gave him the chance that

he was waiting for. By his skill in defending that National Convention against the Parisian insurrectionists on the 13 Vendemiaire, Oct. 5, 1795, the young artillery captain leaped into the limelight of official favor and popular praise. In 1796, partly because of powerful connections and partly because his military worth was dimly discerned by the government, the emaciated, undersized Buonaparte (spelling changed to Bonaparte after 1796) received an appointment to command the French armies in Italy against Austria. Before his departure for Italy he married the charming Joséphine de Beauharnais (see JOSÉPHINE MARIE), widow of a guillotined French general.

When he returned to Paris two years later, he had become the most famous and the most popular person in France. He had fought a campaign of dimless lustre and crowned his victories with diplomatic triumphs over the foremost statesmen of Austria. For France he had gained territory in Italy and Austria's Belgic province on the Rhine. To the needy Government he shipped the gold and silver indemnities of the vanquished, and for himself he gained glory and renown. Another turn of fortune's wheel, and the young military adventurer attained his first great goal. From his romantic Odyssey to the East, where for all that the French people knew he had been plucking fresh laurels instead of suffering heart-breaking reverses, he returned in triumph to a nation weary of its Government's inefficiency and corruption and eager to throw itself into the arms of the first conqueror who would offer it peace, stability and prosperity. On the 18-19 Brumaire, year VIII of the French Republic, Nov. 9-10, 1799, Bonaparte and JOSEPH SIÈYÈS overthrew the Directory, and the former became master in France.

His career up to this date, though brilliant, was only the prelude to his more famous activity from 1799 to 1815. Yet it already illustrated those dominant characteristics of his personality and his policy which were to bring him his greater fame. He himself gave the key to the understanding of his deeds. "Power," he said, "is never ridiculous." His success rested upon his ability to seize and create opportunities and his utterly unscrupulous methods to attain dominance. With his almost mystical faith in his destiny, he directed his tremendous energy, his personal magnetism, and his great talents to the attainment of his ends. A consummate realist and wholly pragmatic in his human relations, he used men for what they were worth to him. Few people in history approached him in his genius for action and administration, in fashioning circumstances and directing men for the object he had in mind. Ultimately his ruthless exploitation of human beings brought about his downfall, but for 15 years he dominated the European scene.

**Empire Established.** From 1799-1802 the Government was the Decennial Consulate, a thinly veiled dictatorship under its republican form. Bonaparte, as he now Gallicized his name, the First Consul, en-

joyed all executive power and, through the Senate and the Council of State and the prefects in the departments, he effectively controlled all Governmental activities. In 1802 his success and his popularity emboldened him to drop the republican pose and establish the Life Consulate which two years later, 1804, was transformed into the hereditary Empire. The Corsican Napoleon Buonaparte had by the wishes of the nation become Napoleon I, Emperor of the French. The people welcomed the new autocracy because Napoleon had abundantly redeemed his promise to the nation. He ended the misrule and the confusion of the last republican Government. He regularized and perfected the administrative centralization of the Old Regime. His prefects restored law and order in the departments and brought security to regions overrun by pillagers and bandits. His central administration restored the financial credit of the country and issued a new and stable currency to replace the worthless paper money of the revolutionary assemblies. Napoleon continued his remarkable military exploits against Austria and England, imposing peace upon the former at Lunéville in 1801 and negotiating peace with England at Amiens in 1802. For the first time in almost a decade France enjoyed peace abroad and prosperity at home, as well as prestige unparalleled since the heyday of Louis XIV.

Thus within three years after the coup d'état of Brumaire, Napoleon had entrenched himself in the esteem of his countrymen and had prevented the Bourbon pretender, Louis XVIII, from regaining control of a country disgusted with revolutionary excesses. But Napoleon himself was "a child of the Revolution." He corrected the abuses, but the great achievements of the Revolution he preserved, first for France and ultimately, as he hoped, for all Europe. He entered into negotiations with Pope Pius VII with whom he signed, in 1801, the agreement known as the CONCORDAT. By this highly realistic act he at once consolidated his own position, reconciled the hostile Catholics within France to the Revolution, and won the Pope's acceptance of those revolutionary acts which the papacy had earlier condemned as anathema. Though the Catholic Church regained a privileged status in the state, it became closely subordinated to the Government. On the other hand the Concordat maintained the religious freedom established by the Revolution, and the papacy agreed to recognize the validity of the sale of the confiscated Church lands. Napoleon encouraged the return of the emigrant noblemen and employed them in his service, but he made no move to restore their confiscated estates nor to restore the feudal dues. He also maintained and strengthened the revolutionary conception of the educational system, forbidding the Church the control of the schools which it had under the kings. Under Napoleon the schools became seminaries of patriotism, the system of Government control of all degrees of education being completed in 1808 by the creation of the University of France. In most of the schools instruction to all citizens was

offered on equal terms. The five codes of law and procedure (*see CODE, NAPOLEON*) that were drawn up under Napoleon's direction by the jurists of his state, in particular the Civil Code of 1804, are perhaps the most signal illustrations of Napoleon's defense of the revolutionary ideals of liberty and equality. While it is true that the later codes were less liberal than the Civil Code, nevertheless in the main they all accepted the changes made by the revolutionary assemblies in the laws concerning the rights of persons and property. Napoleon's early reforms in religion, education and the laws, amply justify his boast that he was "the testamentary executor of the French Revolution."

In 1803 the struggle with England broke out again, not to cease until the Powers of Europe had overthrown the Emperor of the French. Napoleon unquestionably was the more thirsty for military glory in that he realized his precarious position as an upstart in the society of European monarchs. But his wars were in no sense the instruments of a blind and insensate military policy. Napoleon waged his wars to achieve his political purposes, and his political goal steadily grew clearer in his mind. He gradually conceived a plan for a federation of European states under the control of his Empire, perhaps a single European nation, into which he would introduce the Revolutionary system of equality. In 1811 he said, "We need a European code of law, a European court of appeal, a uniform coinage, a common system of weights and measures. The same law must run throughout Europe."

By the end of the year 1810 he came closest to the realization of his goal. The subject states nearest France, namely Holland, Switzerland, the Rhineland, south Germany and Italy, received, along with the burdens of conscription, financial exactions, and French armies of occupation, the advantages of the Civil Code and the orderly French system of administration. Further to consolidate his position he divorced Josephine and married the Austrian princess, Marie Louise, who in 1811 bore him a son, the puny King of Rome. After 1810 Napoleon's decline was rapid, for his very effort to bring the blessings of enlightened rule and material prosperity alienated the support of his followers. Not only the monarchs and the aristocracy of Europe, but the people resisted him; and his conquering armies awakened in Spain, Italy and Germany that powerful sentiment of nationalism which brooked the rule of no foreigner. His empire fell asunder because the cost of enlightened French rule was greater in blood, in money, in loss of political independence, in the irritating, humiliating interference of French generals and French administrators than all the advantages it conferred.

**Rhine Confederation.** In 1803 Napoleon's political influence was already dominant in the small republican states in Holland, Switzerland and Italy. From 1803-07 he busied himself in extending his sway among the Germans. Austria was the first to feel

his hand, at Ulm, Oct. 30, 1805. For the benefit of the large secondary states, such as Bavaria, Baden, Württemberg and Hesse-Darmstadt, which he freed from dependence on Austria only to bind more closely to France by the establishment of the Rhine Confederation, he simplified the map of Germany. He abolished all the innumerable petty states and incorporated them into the territory of the states of the Rhine Confederation. The Holy Roman Empire itself disappeared in 1806, and the Napoleonic Empire virtually extended over south Germany. In the following year, at the Battle of Jena, Oct. 14, 1806, north Germany fell under the French influence, the Prussian territory being divided into three smaller states and Prussia itself reduced to the status of a secondary state under French control. Meanwhile Napoleon had steadily pursued his designs in Italy and in Holland, transforming the republican Governments there into kingdoms which he turned over to members of his family on the condition that they rule them as parts of the Napoleonic Empire. In the TREATY OF TILSIT, 1807, which doomed reduced Prussia, he gained the support of CZAR ALEXANDER I of Russia for his relentless struggle with England.

**Disastrous Russian Campaign.** Unsuccessful in his other schemes of ruining the English, Napoleon devised his stupendous Continental System to close the ports of Europe to British manufactured and colonial goods. In the interests of this scheme, to prevent the leakage of British products into the Continent, he was forced to extend his military rule into the Iberian Peninsula and the coast of the North Sea. The resistance of the Spanish people aroused the spirit of the Germans in Austria and Prussia, and Napoleon found himself with a war against Austria on his hands precisely at the moment when he was in great difficulties in Spain and engaged in the commercial war with England. Momentarily successful against Austria in the Battle of Wagram, July 6, 1809, he fell out, for a variety of reasons, with the Czar, and the disastrous Russian campaign of 1812 sealed his doom. In the two ensuing years his subjects deserted him, and his enemies, England, Prussia, Austria and Russia, conquered him in battle at Leipzig, on Oct. 16-18, 1813, and sent him, defeated but defiant, to the tiny island of Elba. Within a year he escaped and returned for his final adventure on the battlefield of Waterloo, June 18, 1815. This time the Continental Powers took no chances and sent the deposed and subdued Emperor to the distant island of St. Helena where, after six years of despairing inactivity, he died at the age of fifty-two on May 5, 1821. L. G.

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**NAPOLEON III (1808-73)**, Charles Louis Napoleon Bonaparte, Emperor of the French, was born at Paris on Apr. 20, 1808, son of Louis Bonaparte, King of Holland, and Queen Hortense, daughter of Empress Josephine. Brought up by his mother in her

castle of Arenenberg on Lake Constance, Louis Napoleon acquired a miscellaneous education and became a philosophic liberal. In 1831, he assisted the Romagna in a revolt against the Pope. When the Duke of Reichstadt, son of Napoleon I, died in 1832, Louis Napoleon became heir of the Napoleonic tradition. In 1836 he appeared at Strasbourg to enforce his claim but was transported to the United States. A second attempt in 1840, when Louis Napoleon landed at Boulogne, was no more successful and he was sentenced to perpetual imprisonment. For five years, he was confined in the fortress of Ham, but in 1846 he escaped to England. (For the return of Napoleon III as Emperor, his reign, and defeat by Prussia in 1870 see FRANCE, *History*.)

Failing to ally himself with established royal families, the Emperor disappointed the nation by marrying EUGÉNIE-MARIE DE MONTIJO (1826-1920), a Spanish countess of mixed ancestry. A brilliant court was maintained, but on both sides the partnership was devoid of real affection. It was a sick man who, in October, 1870, surrendered to the Germans and was taken as prisoner to Wilhelmshöhe. Having escaped with difficulty from the Tuileries, Eugénie rejoined the fallen Emperor, and together they lived at Chiselhurst, England, where Napoleon died, Jan. 9, 1873.

Napoleon III had one son, the Prince Imperial, born at Paris, Mar. 16, 1856. Trained at Woolwich Academy, he volunteered for active service in the Zulu War of 1879 and on June 1 was ambushed and killed.

**NAPOLEONIC CAMPAIGNS.** Military genius that he was, NAPOLEON invented nothing new in the art and the science of warfare. His greatness lay in the utilization, unparalleled for its effectiveness, of principles long elaborated and operations successfully tested during the wars of the FRENCH REVOLUTION. Thanks to that 18th century improvement in firearms which produced fast-firing muskets, light field guns, horse artillery and light field artillery, the French commanders adopted a new strategy and new tactics which for years utterly confounded their foes. Napoleon, like them, sacrificed rigidity for mobility, the convoy system for requisitioning upon the civilian population, the sword and pike for artillery. Instead of an unbroken army he employed mobile divisions, maneuvered rapidly and independently over a wide terrain for a sharp, unexpected thrust against the enemy, or concentrated with equal rapidity to overwhelm a numerically inferior force of the enemy. In preparation for the charge of heavy masses of battalions in column there came a heavy artillery fire; in the event the charge failed, a rear guard action by horse artillery. This strategy of a prompt offensive along the best line of operations, these tactics of heavy concentration against the weak points of the enemy defense, and that tradition of lavish, reckless expenditure of human life Napoleon had inherited from the Revolution. What he added were a matchless knowledge of topography, a brilliant imagination that anticipated all possibilities of action, a

boldness and precision of movement, and an inspiring magnetism and a sublime self-confidence that aroused officers and soldiers to Herculean endeavors.

**Early Successes.** The first Italian campaign, 1796-97, gave him his opportunity. Appointed to the command of the army of Italy, Napoleon promptly executed a plan of operation which he had carefully prepared in anticipation of events. The campaign opened in Apr., 1796, in the Italian Riviera between Nice and Genoa, and it ended a year later at the eastern extremity of the Alps at Leoben, less than 100 miles from Vienna. Striking from the Riviera through the low mountain passes that lead into Piedmont, he separated the Sardinians and the Austrians, sending the latter scurrying towards Milan and the Sardinians northwestward towards Turin. The latter then sued for peace. A month after the opening of the campaign Napoleon occupied Milan, the capital of Lombardy. He then lay siege to Mantua which blocked his advance towards Vienna. For six months the citadel held out, while four Austrian armies successively met defeat in their efforts to raise the siege, at Lonato and Castiglione, Bassano, Arcola, and Rivoli. Mantua opened its gates in Feb. 1797, and the last barrier to Napoleon's march to Vienna was removed. In 12 months the army of Italy had fought 18 battles, defeated five Austrian armies, taken more than 100,000 prisoners and 600 cannon; and Napoleon had written his name beside the greatest generals of history.

The romantic Egyptian expedition, 1798-99, afforded him further opportunities for the display of his daring and ingenuity, but despite his victories—the Battle of the Pyramids, July 21, 1798; the Syrian campaign of 1799; and the triumph of Aboukir, July 1799—England's control of the Mediterranean, assured by Nelson's destruction of the French fleet in Aboukir Bay on Aug. 1, 1798, nullified all his gains and doomed his project to failure. He succeeded, however, in escaping from Egypt and returned in safety to France where, shortly after, he overthrew the government of the Directory in the coup d'état of Brumaire.

As First Consul Napoleon undertook the second conquest of Italy, which meantime had been lost to the Austrians. It was the part of caution to concentrate the French offensive in South Germany, clear the way to Vienna, and force the Austrians to abandon their advanced positions in Italy. But the reluctance of Moreau to serve as Napoleon's subordinate in these operations forced the latter suddenly to alter his original plans and with great secrecy and daring to lead his reserve army over the passes of the Great Saint Bernard into the plains of northern Italy, May 1800. Despite this brilliant beginning, Napoleon made a tactical error which all but ruined his hopes of success. Confident of defeating the Austrians who were concentrating at Alexandria, some 40 miles to the southwest of Milan, he divided his forces in order to cut off the enemy's avenues of escape. He was confronted, however, by the main body of the enemy on the plains of Marengo on June 14, 1800, and forced

to fall back. His retreat threatened to degenerate into a rout, when fortunately, Desaix, who had heard the sound of the battle, reappeared on the scene with fresh troops, thus turning defeat into a decisive victory. After the success of Moreau at Hohenlinden on Dec. 3, 1800, Napoleon succeeded in imposing the Peace Treaty of Lunéville upon the Austrian Government.

**Brilliant Campaign of 1805.** The short campaign of 1805, which terminated the War of the Third Coalition, has rightly been judged the most brilliant of the Napoleonic campaigns. It comprised two sets of operations: one against the Austrians in Bavaria and the second against the Austro-Russians in Moravia. Far from being elaborated in its entirety at Boulogne, where Napoleon had projected an invasion of England across the Channel, Napoleon's plan of operations was a dazzling work of improvisation, dictated by the information that his reconnoiters brought him. Essentially, these operations resolved themselves into a simple flanking movement against the Austrian commander, Gen. Mack, who had entrenched himself at Ulm on the upper Danube. Whatever Mack's ultimate intentions were, and they were less fatuous than commonly supposed, the consequences were disastrous for him. Napoleon crossed the Rhine north of the Black Forest, penetrated through the valleys of the Neckar and the Main, swinging his six corps in the great arc from the Main to the Danube in the rear of Ulm, thus preventing the union of the Austrians and the 100,000 Russians whom they were awaiting and enclosing the former in an iron ring. Misled by false rumors of an impending French retreat and confused by the superb cavalry tactics of Murat, Mack failed to make his escape from Ulm, which capitulated, Oct. 22, 1805, less than a month after the opening of the campaign. The second half of the campaign culminated in the "model battle" and famous French triumph before Austerlitz (*see* AUSTERLITZ, BATTLE OF) on Dec. 2, 1805, and brought to a close the operations of the War of the Third Coalition.

The War of the Fourth Coalition, 1806-07, comprised two campaigns: a brief campaign in Saxony against the Prussians, marked by the two battles of Jena and Auerstadt; and a long campaign against the Russians in Poland, in which were fought the battles of Eylau and Friedland. Acting promptly on the Prussian monarch's ultimatum, Oct. 7, 1806, to evacuate Germany, Napoleon directed the advance of his Grand Army, then in South Germany, over the slopes of the Thurginian forest into Saxony. His purpose was to force the full concentration of the Prussian-Saxon forces of 127,000 men to block the advance of his 200,000 veterans upon Berlin. This expectation was unfulfilled, for at Jena the main French army caught up only with the enemy rear guard. The fighting at Jena, Oct. 14, 1806, where Napoleon falsely believed that the entire Prussian army was engaged, was a series of efforts in which the Prussians were locally defeated, because of the failure of their com-

manders to prevent the concentration of the French in a commanding position. While Napoleon was crushing Hohenloe at Jena, his advance guard under Davout, sent ahead to cut off the Prussian retreat, met the main Prussian army under the Duke of Brunswick at Auerstädt, some 12 miles to the north. Again, as at Marengo, Napoleon had blundered; but Davout and Lannes held their ground until the Prussian command, demoralized by the death of Brunswick, gave the order for retreat. The vanquished of Jena and Auerstädt then fell back in a panicky retreat upon Weimar. Only the Russians remained in the field against Napoleon. But the immense distances and the poor roads of Poland, the difficulty of reorganizing a supply and transport system, the fickleness of the weather with its sudden thaws following upon heavy snows, made extensive cavalry and artillery operations dangerous. The first major clash came in mid-winter at Eylau in East Prussia, where in a blinding snow storm a bloody and indecisive engagement took place. Four months later Napoleon's reenforced and rested troops attempted an encircling movement to cut off Bennigsen's Russians from Königsberg, their base of supplies. Bennigsen hurried back, but allowed Napoleon to maneuver him into a weak position at Friedland, on the little stream, the Alle, where the artillery fire of the French won the Emperor a complete triumph. With this battle the war of the Fourth Coalition was ended, for in July 1807, Napoleon and Alexander I signed the *TREATY OF TILSIT*.

**Causes of Napoleon's Downfall.** The War of the Fifth Coalition, 1809, found Napoleon in Spain, personally directing a disastrous war which may be considered the first great cause of Napoleon's downfall. (See *PENINSULAR WAR*.) Requiring the presence of more than 300,000 of his veterans, it condemned Napoleon to rely upon his foreign contingents and his raw French conscripts. Austria, meantime, under the new leadership of Stadion, Metternich and Archduke Charles, had not only effected a reform of the army and the administration, but had enlisted the enthusiastic patriotism of her subjects in a national war against the French. In this war, as in all his subsequent wars, Napoleon fought not only against dynastic rulers and their aristocratic supporters, but against peoples as well. The campaign opened with a blunder committed by Berthier, Napoleon's chief of staff, who failed to order the concentration of the French troops in Bavaria, thus leaving an immense gap between Davout's corps at Ratisbon and the other French corps in Bavaria. Had Archduke Charles acted rapidly he could have thrust a wedge between the French and, turning, beaten them in detail. While Napoleon hurried to the field and brusquely directed the concentration of his troops, the Archduke failed to take advantage of his opportunity, for he moved against Ratisbon in the hope of securing his communications with Bohemia. Napoleon's lightning improvisations gained him the advantage of position; moving on interior and shorter

lines, he fought an extraordinary five days' campaign, defeating the Austrians in detail and forcing Charles at Eckmühl, Apr. 23, 1809, to retire. From Vienna, which he occupied, Napoleon attempted to carry the offensive against Charles, who had taken a new position north of the Danube. As the Archduke had burned the bridges over the river, Napoleon tried to cross it by utilizing the small wooded island of Lobau, but he suffered a terrible reverse at Aspern, or Essling, when his pontoon bridges were destroyed and his troops were forced to hew their way back from the northern bank of the river to the island. His generals then counseled retreat; but Napoleon decided upon a fresh offensive, which, under the circumstances, was a daring and dangerous move. During the following six weeks he surpassed himself in a systematic preparation for his move against the unguarded north bank of the Danube. On July 5 he made good his crossing and in the murderous two-day struggle at Wagram forced the Archduke to fall back. Here his untried conscripts almost failed him against the superb Austrian infantry; but his superiority in artillery won the day for the French.

The catastrophe of the Russian campaign of 1812, the war of the Sixth Coalition, was the second great cause of Napoleon's downfall. With a total force of more than 600,000 men, of which less than a third was French, he advanced into Lithuania in June 1812, intending to devote two years to the defeat of the Russians. The first year he would secure Lithuania; and in the second year he would advance from Smolensk to Moscow. But the Russians retreated steadily before an army three times as great as their own, and not until he reached Smolensk on Aug. 17 did Napoleon catch up with their rear guard. There, with his army already diminished by more than 100,000 men, with his service of supplies in danger of collapse, with a barren country empty of resources about him, Napoleon made a fatal decision. He decided to take advantage of the good campaigning weather to press on to Moscow. He could not brook the thought of enforced inactivity in Lithuania, nor could he contemplate the prospect of an ignominious retreat. He advanced, and on Sept. 7, his rapid advance brought him face to face with Kutusov at Borodino on the River Moskova. Kutusov, appointed generalissimo of the Russian forces, abandoned the Fabian tactics of his predecessor, Barclay de Tolly, and offered battle to the invader. The Battle of Borodino was a terrible carnage with appalling losses on either side; but the Russians withdrew and a week later Napoleon occupied Moscow. In Moscow, as at Smolensk, Napoleon was the architect of his own ruin; his error in lingering in the smoldering ruins of the city brought its awful retribution upon him. His terrible retreat, delayed too long despite the lateness of the winter, ended only when the pathetic survivors of his Grand Army reached the Niemen again at Kovno on Dec. 16, 1812. See *RUSSIA, HISTORY OF*.

The War of Liberation of 1813 was fought in Germany, principally in Saxony. There were two series

of operations, separated by an armistice and diplomatic negotiations: a spring campaign against the Russo-Prussian forces in Saxony and Silesia and a fall campaign against a general coalition in Saxony. Between his return to Paris and the outbreak of the war in Germany Napoleon accomplished the remarkable feat of raising a new army of 226,000 men in France and with it almost 500 guns. But his veterans and his cavalry were far from him in Spain. At Lützen near Leipzig and at Bautzen in Silesia, Napoleon's tactics were still admirable and his raw troops valorous and steady; but his victories were indecisive, for he lacked the cavalry to pursue the foe and make the triumphs complete. In the hope of gaining reinforcements and recalling his cavalry from Spain he accepted the Austrian offer of mediation and concluded an armistice, but the breakdown of negotiations found the enemy more numerous, stronger and more determined. The second half of the campaign was marked by the decisive struggle at Leipzig (*see* LEIPZIG, BATTLE OF), which cost France the loss of all Germany.

Napoleon's downfall was now near at hand. While the allies virtually appealed over his head to the French people, as Woodrow Wilson was to do with Germany in 1918, and followed their appeal with an invasion of France early in 1814, Napoleon exerted himself as never before. He fought perhaps the most brilliant defensive campaign of all history, the French campaign of 1814, proving how effective a small army moving on interior lines could be against a superior enemy force suffering from a divided command. For a moment after his initial defeat at La Rothière, Feb. 1, he was prepared to negotiate, but he brusquely changed his mind when he learned that Blücher's Prussians and Schwarzenberg's Austrians had separated, the former striking north into the valley of the Marne and the latter moving on Paris by the Seine basin. In a series of incredibly rapid thrusts Napoleon fought seven victorious engagements in eight days, forcing Blücher back to Châlons and Schwarzenberg to Troyes. These victories, however, were unavailing, for Blücher obstinately refused to admit defeat. Reenforced by Bülow's troops he held Napoleon at bay at Laon. His men were on the march again to rejoin the Austrians when Napoleon met and retreated before Schwarzenberg at Arcis sur Aube on Mar. 20. This was the end, for while Napoleon still planned to rouse the garrison troops in Lorraine, the conquering allies marched directly upon Paris and forced its surrender. Abandoned by his despairing marshals, Napoleon agreed to abdicate on Apr. 6, 1814. Fourteen months later he fought his last campaign, in Belgium, and suffered his final reverse. *See* WATERLOO, BATTLE OF. L. G.

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**NARBONNE**, an ancient city of southern France, department of the Aude. It was the seat of the first

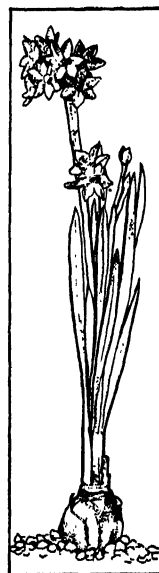
Roman colony in Gaul. A metropolis under changing rulers, the town lost much of its prosperity because the harbor silted up at the end of the Middle Ages. Narbonne has a Gothic church, St. Just, but few Roman remains. It is an important wine center and its honey is celebrated. Pop. 1931, 31,909.

**NARCISSUS**, in Greek mythology, son of the river god Cephissus and the nymph Liriope, was a beautiful youth loved by many, but loving none. The rejected maidens asked NEMESIS to avenge them, so she made Narcissus fall in love with his own image as he saw it reflected in a pool. He pined away and was changed into the flower narcissus.

**NARCISSUS**, a genus of hardy handsome bulbous plants of the amaryllis family, many of which are widely cultivated. There are about 40 species native chiefly to Europe and Asia. They bear narrow rush-like leaves and large yellow and white, usually nodding flowers terminating an unbranched stalk, a foot or two high. Among the best known cultivated species are the DAFFODIL (*N. Pseudo-Narcissus*), the JONQUIL (*N. Jonquilla*), the polyanthus (*N. Tazetta*) and the poets' narcissus (*N. poeticus*). The horticultural narcissi comprise numerous hybridized and otherwise modified forms furnishing many early bloomers from the outdoor garden and pot-plants suitable for forcing.



HYBRID NARCISSUS  
*Narcissus Leedsii*



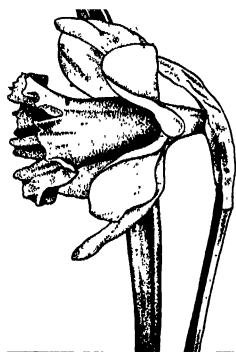
WHITE NARCISSUS

**NARCOTICS**, drugs which in small quantities lessen the appreciation of sensation and in larger quantities produce a stupor which may readily pass into sleep. The main narcotics in present day medical use are MORPHINE and ATROPINE. Stramonium and hyoscyamus are narcotics which are but little used.

Narcotics act by depressing the central nervous system. This results in a dulling of appreciation of sensory impulses, a reduction in quality of motor impulses, a diminution of spontaneous activity, and a general elevation of the threshold for reflexes. Pure narcotics belong to the class of organic chemical compounds known as ALKALOIDS. Such substances act in extremely minute amounts.

When used frequently, certain narcotics and re-

lated alkaloids tend to produce addiction which is overcome only with great difficulty. To prevent undue use of these substances a legal enactment, the Harrison Narcotic Law, prevents their sale except on



BICOLOR NARCISSUS

*A trumpet narcissus with the flower segments and crown of different shades*

the prescription of a registered physician, and prohibits the refilling of prescriptions containing them. The main drugs restricted by the law are: OPIUM and its derivatives (MORPHINE, papaverine, etc.), APOMORPHINE, ethyl morphine, CODEINE, HEROIN, and COCAINE.

**NARCOTICS, CAMPAIGNS AGAINST ABUSE OF,** the international efforts to regulate the production and use of narcotics, particularly opium and cocaine and their derivatives. Opium has been

known and used in Oriental countries for many centuries; it is mentioned in Chinese documents of the 7th century A.D., and its use as a medicine is described in medical works dating from the 12th century. Its use was not wide-spread, however, as the absence of imperial prohibitions indicates. Opium became an item in the trade carried on by western traders in Chinese waters soon after that trade started, with the Dutch controlling the shipments to China in the first three-quarters of the 18th century and the British East India Company then becoming dominant. (See EAST INDIA COMPANY.)

In 1729 the imports of opium into China were 13½ short tons, in 1790 they were 264 tons. This growth in imports led to increasing attempts by the Chinese authorities to check the traffic as the evil effects became year by year more apparent. In 1729 the Chinese emperor prohibited the smoking of opium. In 1780 the viceroy at Canton prohibited its importation and smoking. In 1800 the emperor prohibited not only the importation of opium but its cultivation in China. The traffic became contraband, but the amounts imported continued to grow because huge profits were to be made. The annual average of imports for 1811-21 was 300 tons, that for 1835-39 was 2,000 tons. The Sino-British war of 1839-42 was caused in part by the destruction by Chinese officials of 1,330 tons of British-owned opium at Canton by the Chinese officials in an effort to enforce the prohibition, though opium is not mentioned in the peace treaty. Importation was legalized in the tariff arrangements entered into in 1858. In 1860, the peak year, opium imports were approximately 5,660 tons, by 1905 they had dropped to 4,330 tons.

The bulk of the imported opium during the 19th century came from India, being produced by independent Indian princes and by the British East India Company in the earlier years, and later under British

government auspices. Turkey and Persia also supplied opium for the China traffic, but in the latter half of the 19th century, 1863-1905, on the average 95% of the imports came from India. Meanwhile production in China had been growing steadily; in 1905, it was over 25,000 tons.

Beginning in 1906, under the leadership of the Empress Dowager Tzu Hsi, determined efforts were made to stop the use of opium in China. A program of ceasing production altogether in ten years was adopted. This was very largely successful by 1917, but then political disorganization in China led to a revival of opium production since the military chieftains found in it an important source of revenue. In 1907 an agreement had been made between the Chinese and Indian governments by which the exports of Indian opium to China were to be cut down year by year so that they would cease altogether in 1917, this being conditional on the suppression of production in China. By the end of 1917, legitimate production of opium in China had come to an end, and imports from India had stopped. Since then the Chinese production has grown to large proportions—though probably not to the total of 1905—but the exports of opium from India to China have remained nil.

The United States became concerned over the spread of opium traffic after acquiring the Philippine Islands. Importation and sale of opium in the Philippines were prohibited in 1908 except for medicinal purposes. In that same year, the United States suggested to Great Britain that the several nations concerned with opium in the Far East should form a joint commission to consider opium suppression measures. Britain agreed, and in February, 1909, delegates from the American, British, Chinese, Dutch, French, German and Japanese governments met at Shanghai. This commission, among other things, urged that the governments concerned take measures strictly to regulate the departure from their ports of shipments of opium and other narcotics, and expressed the opinion that the unrestricted manufacture and sale of morphia, an opium derivative, already had become a grave danger. Experience had shown that many of those who gave up opium, as a result of the Chinese prohibition efforts, were taking to morphia. This 1909 meeting in Shanghai was the first attempt to get joint action by several nations in controlling the international drug traffic.

Meanwhile, the production and distribution of opium in India had been brought under strict regulation by the British government, and control through monopolies had been established in the several foreign colonies and possessions in the Far East. In 1926 the Indian Government announced that opium exports would be reduced annually so that they would cease altogether, except for medical purposes, in 1935.

In 1912, 1913 and 1914, international conferences were held at The Hague, to deal with the narcotics problem. The 1912 conference prepared The Hague



convention of that year. This provided for a system of government licenses for the manufacture, sale, distribution, import and export of opium and cocaine derivatives, as well as dealing with the distribution of raw and prepared opium. Exchange between the governments of information on progress in narcotics control and on violations of control agreements was agreed on. The United States duly ratified the 1912 Hague convention, but a number of other governments failed to do so. Opium was being produced in Turkey and Persia in increasing quantities, and the governments of these countries were deriving substantial revenues from this source, so that they were unwilling to join in prohibition efforts. France exempted her Far Eastern possessions from application of the limitations on the ground that these could not be enforced since the areas were close to Chinese and other territories where there was no effective control. On the same ground, the authorities in the other foreign possessions in the Far East insisted then and since that complete prohibition was impossible and that consequently regulation through the maintenance of monopolies was essential.

The peace treaties of 1919-20 provided that their ratification should carry with it ratification of the 1912 Hague narcotics convention by those countries which had not already ratified this agreement. The League of Nations Covenant (Article 23-c), placed on the League the responsibility for carrying on the efforts to control narcotics. The first League assembly created an advisory committee on opium and other dangerous drugs. In 1924 a conference, under League auspices, was held to deal with opium. An agreement was reached providing for the progressive suppression of opium exports and use over a period of 15 years, the period to begin after the poppy-growing countries had established effective control of illicit as well as licit exports. This agreement has not yet come into effect. In 1925 another conference under League auspices was held to work out plans for the control of the manufacture and distribution of narcotic derivatives. A system of import and export certificates was elaborated, by which each government was required not only to regulate by license manufacture at home but to control exports by permitting them only on the presentation of duly authorized certificates for import into the country of destination. The American representatives who attended this conference did not sign the agreement because they felt it did not go as far toward effective regulation as their instructions required.

In the succeeding years, experience showed that as long as there was no effective limitation of the manufacture of narcotic derivatives to amounts needed for legitimate medical and scientific purposes, large quantities would find their way into the illicit traffic and be smuggled from one country to another in spite of the most stringent laws. American laws, for example, had effectively limited the import of raw opium and the manufacture of narcotic products within the country, and had also put the export of

narcotics under rigidly enforced control which virtually stopped exports. Nevertheless huge quantities of morphia, cocaine and other derivatives were being smuggled into the country. Japanese laws, similarly, effectively controlled manufacture and sale and import in Japan, but large quantities of Japanese-made or imported narcotics were being illicitly distributed in China. Those concerned with the problem therefore worked toward limiting manufacture. In 1931 another conference to deal with this problem was held at Geneva, under League of Nations auspices, and a new convention was agreed on which provided for machinery to determine what were the legitimate needs of each country and of the world as a whole for narcotic derivatives, and to limit manufacture to the amounts required. This convention also provided that any new derivative was to be considered as a dangerous drug and hence to be subject to limitation until it had been proven to be not habit-forming. The American representatives signed this agreement. The coming into force of this convention, by ratification of the required number of governments, will be a long step toward effective narcotic control.

Meanwhile the problem of the control of opium production had received considerable attention, particularly in connection with China, Turkey and Persia. Opium as such has given place as a world-wide drug menace to narcotic derivatives which are much more potent in considerably less bulk, but the western countries with Far Eastern possessions, except the United States, insisted that they could not stop opium consumption in their areas as long as opium was grown virtually uncontrolled in China and hence could be smuggled into the nearby regions. An international conference met at Bangkok in 1931 to deal with this problem, but came to no definite conclusions. In China itself, proposals were revived for the establishment of a governmental opium and narcotics monopoly as a means of getting control of the traffic, so that it might be regulated and eventually suppressed. No opium had been legally imported into China since 1917, but large amounts had been smuggled both in and out, and the production in the country had grown greatly. The smuggling of morphine and cocaine also had reached large proportions.

The chief difficulty in the way of effective control of the production and distribution of narcotics has been financial. Enormous profits are made from the illicit drug traffic, so that there is a powerful incentive to oppose and to circumvent regulation. The governments which attempt to regulate the traffic by monopolies and licenses also get substantial revenues from this source. But as the harm which these drugs do is coming increasingly to be recognized, progress is being made toward control of their production.

G. C.

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**NARDI, JACOPO** (1476-1563), Italian statesman and historian of noble family, was born at Florence July 21, 1476. His early writings include two comedies, *Amicizia* (1509) and *Felici Rivali* (1513); *Canti Carnascialeschi* (1513) written on Leo X's accession to the papacy; and *Discorsi Politici* (1534). Having espoused the cause of SAVONAROLA, Nardi was exiled in 1531 and his possessions confiscated. During his exile he completed his *History of Florence*, a work rivaled in his time only by Guicciardini and Machiavelli. Nardi died at Venice Mar. 11, 1563.

**NARENTA**, also Naretva, anciently Naro, a river of Yugoslavia. It rises in the mountains of southern Bosnia and flows in a southwesterly direction across the former province of Herzegovina, passing Mostar, the capital. The Narenta passes through gaunt mountain scenery and after traversing southern Dalmatia enters the Adriatic by a number of channels. Its total length is about 150 mi. The Narenta is open to small vessels to the town of Metkovitch, only a short distance from the Gulf of Narenta.

**NARINO, ANTONIO** (1765-1823), Colombian leader, was born of a noble family in Santa Fé de Bogotá on Apr. 9, 1765. He studied at St. Bartholomew College and served in a number of administrative posts during the last days of the viceroyalty. He is best known for his translation from the French of Paine's *Declaration of the Rights of Man*, which he printed on a press of his own. The copies were clandestinely distributed in 1794 and led to Narino's arrest and eventual exile to Spain. The influence of the propagation of these ideas was incalculable in arousing the spirit of independence in Colombia. He returned to America after a second exile in 1810 and in 1811 he overthrew the government of the State of Cundinamarca and became its head. Narino was a fanatical protagonist of "unitarianism," or a highly centralized form of government. He refused to allow his little state to enter the federation approved by many of the other Colombian states, fighting both the Spaniards and the federalists. He was captured by the Spaniards in 1814 and sent to Cadiz. Released in 1820, he returned to Colombia and died in Leiva on Dec. 13, 1823.

**NARRAGANSETT**, formerly one of the most important North American Indian Algonkian tribes of New England. They occupied Rhode Island to the west of Narragansett Bay and most of the islands in the bay and claimed additional territory by right of conquest from the Pequot and Niantic, a sub-tribe, coordinated with the Narragansett after King Philip's War. The Narragansett, having lost a large part of their population in this war, took refuge with some of the interior tribes, probably the Mahican and Abnaki. In 1682 some of the tribe returned and were settled with the Niantic who had not joined in the war, and then the combined group were called Narragansett. As more and more pressure was exerted by the white colonists, the Narragansett settlement at Charlestown, R.I., was broken up, some joining the Brotherton Indians in New York in 1788. Some

mixed-bloods, the descendants of marriages with Negroes, live near the Mohegan at Norwich, Conn.

**NARRAGANSETT**, a town including Narragansett Pier, a fashionable resort, in Washington Co., southern Rhode Island. It is situated on the Atlantic Ocean, 30 mi. south of Providence and is served by of Narragansett Pier Railroad. Narragansett Pier is a settlement of handsome hotels and summer residences, a casino and bathing pavilion, built around a crescentiform beach, celebrated for its beauty. Point Judith lighthouse and country club are situated on Point Judith, 5 mi. south. The site was settled in 1675, and the pier, no longer there, built in 1815. The town was incorporated in 1901. Pop. 1920, 993; 1930, 1,258.

**NARRAGANSETT BAY**, an inlet of the Atlantic Ocean, from which it extends northward into Rhode Island, almost to Providence. It is about 28 mi. long, with a width varying from  $4\frac{1}{2}$  to 8 mi., and is navigable for ocean-going vessels throughout its length. Newport, Rhode Island's famous summer resort, is on its south shore, while Narragansett Pier is on the west shore.

**NARROW WOVEN FABRICS** are defined by the United States Tariff Survey as fabrics with fast edges, i.e., edges that are finished in the process of weaving, and not exceeding 12 ins. in width.

The construction of narrow woven fabrics does not differ materially from that of wider fabrics; there are two distinct systems of threads running at right angles to each other—the longitudinal threads constituting the warp or ends, and the cross threads constituting the filling or picks. Additional systems of warp or filling may be incorporated for figure, weight, thickness, or binder.

The warp threads for each individual fabric and for each system are usually wound on a separate warp beam and placed in the back of the loom. The ends are then drawn through the harnesses according to a prearranged plan, and then through the reed to the front of the loom. Each time the various harnesses are raised and lowered to form the different sheds in accordance with the pattern or design, the shuttle inserts a pick and then the reed with a forward movement beats the pick "home." The repetition of these movements constitutes the process of weaving. As the material is woven it is automatically drawn forward and wound on blocks or run into boxes.

Any manner of interlacing may be employed in the construction of narrow woven fabrics, and all kinds of materials are used. The incorporation of india rubber warp threads results in an elastic webbing.

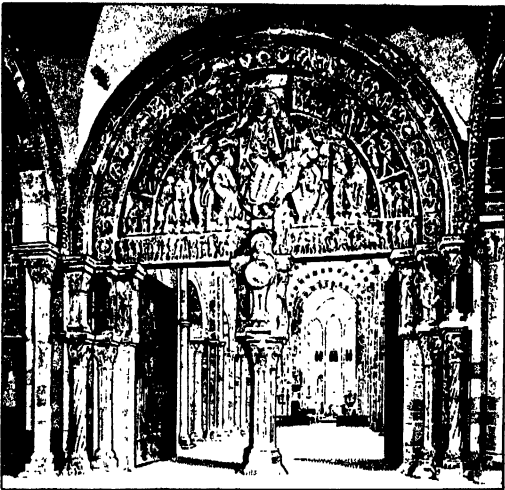
Among narrow woven products are listed tapes, ribbons, webbings, bandings, bindings, beltings, garters, gimps, galloons, suspenders (elastic and non-elastic), name webs and name labels, gorings, wickings, hat bands, tubings, and all kinds of ornamental trimmings. Most narrow fabrics are sold by the gross (144) yards, and are usually put up in  $\frac{1}{4}$  gross,  $\frac{1}{2}$  gross or 1 gross rolls.

The machines on which narrow woven fabrics are manufactured are known as narrow ware looms and are so constructed that a number of units may be produced at one time, the range being from 2 to 84. Each unit is woven independently of the others, and has its own particular shuttle, but all the units in one machine start and stop together. The shuttles work in unison and are operated by a rack and pinion mechanism.

The first plant in the United States devoted primarily to the manufacture of narrow woven fabrics was established in Rhode Island in 1824, and that state still leads the rest of the country in this industry.

E. J. G.

**NARTHEX**, an enclosed porch, particularly in connection with a church, usually extending across the entire entrance front, with doors on one side leading into the atrium or out to the street, and on the other leading in to the nave and aisles of the church proper. The great size and rich development of the narthex in the early Christian basilicas and many



CHURCH OF THE MADELEINE, VÉZELAY, FRANCE, SHOWING NARTHEX AND PORTAL TO THE NAVE

Romanesque and Byzantine churches resulted from the general custom of excluding from the church proper any but the initiated, or baptized; the catechumens had to remain in the narthex. Characteristic examples are that of the Basilica of St. Maria in Cosmedin, Rome, 11th century, and those of St. Sophia, Constantinople, 6th century, and St. Mark's in Venice, 11th century.

**NARVA**, a city and seaport of Estonia, situated on the Narova River, 8 mi. from its entrance into the Gulf of Finland. The waterfalls of the Narova furnish the power for a large textile manufacture. Before the World War, when the city was under Russian rule, there were more than 10,000 workers employed in the mills. Now the number is about 2,000. Fishing is also an important occupation. The city was founded by the Danes in 1223. The Rus-

sians captured it in 1704 and held it till 1918 when Estonia became an independent republic. Est. pop. 1931, 25,205.

**NARVA, BATTLE OF**, a celebrated battle between the 8,000 troops of Charles XII of Sweden and the Russian force of 40,000 led by Gen. Dolgoruki, which took place outside the town of Narva, in Estonia. The Russians were besieging a small force of Swedes in Narva when on Nov. 20, 1700, Charles arrived to relieve his countrymen. He vigorously attacked the entrenched camp of the Russians, and despite his comparatively small force he annihilated the enemy forces. The Russians lost 18,000 men, and Charles only 2,000.

**NARWHAL** (*Monodon monoceros*), a species of WHALE remarkable for the fact that in the males the teeth have been reduced to a single tusk of the upper jaw. The tusk projects forward from the mouth as a twisted horn, often more than half the length of the body, which may measure 15 ft. This animal, spotted white in color, is confined to Arctic seas, and is fairly numerous in small herds about Greenland. It is hunted for flesh, oil, and the valuable ivory of its horn. The horn is apparently of service in battles between males, as an aid in breaking breathing-holes through the ice, and possibly as a fish-spear. Its habits and food are little known.

E. I.

**NASBY, PETROLEUM V.** See LOCKE, DAVID ROSS.

**NASEBY, BATTLE OF**, an engagement on June 14, 1645, in Northamptonshire, England, between the "New Model" army of 13,000 men under Lord Fairfax and Cromwell and Charles I's army of 10,000 men under Prince Rupert. At first the Royalist cavalry and infantry were successful in breaking through the enemy lines, but became disorganized in pursuit. Cromwell and Fairfax, remaining on the field, attacked the center of the Royalist line from front and rear and utterly crushed it. They captured the standards and private papers of Charles and half his army. By defeating the last army which Charles I could muster Cromwell practically made further Royalist resistance to his government an impossibility.

**NASH, MELL ACHILLES** (1890- ), American educator, was born in Tryon, Hardin Co., Tex., July 20, 1890. He graduated at the Central State Teachers College, Oklahoma, in 1910 and was successively a rural school teacher, high school principal, and school superintendent until 1919 when he studied for his A.B. and M.A. at the University of Oklahoma. The following year he became chief high school inspector for the state. As state superintendent of public instruction from 1923-27, he brought about a marked improvement in rural schools. In 1927 Nash became president of the Oklahoma College for Women.

**NASHE, THOMAS** (1567-1601), English satirist, was born at Lowestoft, in Suffolk, in 1567. He was educated at Cambridge, and became one of the keenest of satirists. In the Marprelate controversy he sided with the bishops against the Puritans, and wrote many

tracts. His preface to Greene's *Menaphon* contains lively literary criticisms; and in *Pierce Peniless* he satirizes a society which leaves its most gifted members in poverty. The hero of *The Unfortunate Traveler* is a forerunner of Defoe's adventures. Nash's play, *The Isle of Dogs*, was suppressed, and in *Christ's Tears Over Jerusalem* the author seemingly repents of his vituperations. He died in 1601.

**NASHOBA**, a communal settlement founded in the autumn of 1825, by Frances Wright, famous humanitarian and feminist. The tract of 2000 acres, about 13 miles north of Memphis, was dedicated to the education of Negro slaves toward social and economic equality with whites, and was populated by Negroes purchased by Miss Wright and others loaned by enlightened planters. The Negroes divided their time between attendance at model schools and agricultural labor, half the proceeds of which were devoted to maintenance and half to an emancipation fund. The first several months were successful, but Miss Wright became ill and went to Europe for recuperation. Nashoba was deeded, Dec. 1826, to a group of eight philanthropists, including Robert Owen, "in perpetual trust for the benefit of the Negro race." The trustees advanced diverse utopian projects, and were erratic administrators. Deterioration set in, and Miss Wright returned after more than a year but was unable to arrest the decline. In June 1828 the experiment was abandoned; the slaves were given their freedom and removed to Haiti.

**NASHUA**, a manufacturing city in southern New Hampshire, the county seat of Hillsborough Co., situated on the Merrimack River at the mouth of the Nashua, 15 mi. south of Manchester. The city is built in an amphitheater formation of the White Mountains surrounded by good farms and wooded territory. There is an airport and the Boston and Maine Railroad serves the city. Nashua has shoe factories and cotton and gummed paper mills. In 1929 the manufactures reached an approximate total of \$43,000,000; the retail trade was valued at \$15,251,362. Nashua was founded as Dunstable in 1673. The city was chartered about 1852. Pop. 1920, 28,379; 1930, 31,463.

**NASHVILLE**, the capital of Tennessee, a city in the north central part of the state, the county seat of Davidson Co. It is situated on the Cumberland River, 209 mi. northeast of Memphis. Bus and truck lines, barge and other river craft and three railroads serve the city. Sky Harbor, the municipal airport, is 25 mi. southeast of the city. Nashville lies in the Blue Grass Region in a fine stock-raising, dairying and agricultural country. The finest buildings in the city are the state house and the state capitol, the grounds of which contain the grave of James K. Polk. The banks of the river are connected by seven bridges. The Hermitage, Andrew Jackson's plantation, is at Old Hickory, a suburb of the city. Nashville is the seat of Vanderbilt University, founded in 1873; the George Peabody College for Teachers, founded in 1875; Ward-Belmont School for Girls and two out-

standing Negro institutions, Fisk University and Meharry Medical School. The city has railroad shops, printing houses and many factories; the products include roasted coffee, shoes, stoves, structural steel, fertilizers, hosiery, textiles and men's clothing. In 1929 the factory output was worth about \$109,000,000; the wholesale trade proper amounted to \$74,037,066, and the retail to \$93,602,897. Nashville was founded in 1779, first incorporated in 1784 and incorporated as a town in 1801 and as a city in 1848. It was made the state capital in 1843. In 1913 the commission form of city government was adopted. The Battle of Nashville was fought here in Dec. 1864. During the World War the United States Government built the Old Hickory Powder Plant on the opposite side of the river. Pop. 1920, 118,342; 1930, 153,866.

**NASHVILLE, BATTLE OF**, Dec. 15-16, 1864, an engagement in the CIVIL WAR which resulted in a disastrous defeat for the Confederacy. After their victory at Franklin (*see* FRANKLIN, BATTLE OF), the Union troops under Gen. Schofield proceeded to Nashville, where Gen. Thomas assumed command of the augmented army. Gen. Hood pursued and prepared to attack, although his Confederate army was outnumbered by 10,000 men. Bad weather halted Hood's movements. On Dec. 15, taking advantage of a heavy morning fog, Thomas disposed the Union force for an attack, Generals Steedman, Thomas, Schofield and A. J. Smith commanding the line from left to right. The main work of the day was directed against the Confederate left flank, Gen. Smith being assisted by the Federal cavalry under J. H. Wilson. The drive was successful, and the entire Confederate line forced back to a new position. On the 16th the Union troops renewed the fight; the enemy was routed and demoralized. The Confederate army was reduced to scattered remnants; Hood himself fled too rapidly to be overtaken, and after crossing the Tennessee River dispatched to Richmond his resignation from command.

**NASI** ("prince"; called also Patriarch), the title given to the presiding officer of the Jewish Sanhedrin, or court of law, in Palestine. The vice-president of the Sanhedrin, or second presiding officer, was called the Ab Beth Din, or father of the court. Originally the Ab Beth Din appears to have been the sole head of the Sanhedrin; later the Nasi was the secular and temporal head, while the Ab Beth Din was the spiritual head. The Nasi, the relic of the high priest, had charge of state affairs, while the Ab Beth Din was concerned with the affairs of the synagogue. The title of Nasi as a designation for the president of the Sanhedrin first came into use after the descendants of HILLEL (30 B.C.-10 A.D.), who himself claimed descent from the royal house of David, became the hereditary occupants of the office of president of the Sanhedrin. The Nasi appears to represent the secularization of the temporal power of the Jewish priests after the destruction of the Temple. Hillel was the first Nasi, or spiritual head of the Jewish people in Palestine. Another prominent Nasi was Judah

Hanasi, who attained to the office about 170 and redacted the Mishna between 180 and 220. Of the 15 patriarchs who presided over the spiritual affairs of Judaism from the days of Hillel to 425, two were named Hillel, three Simon, four Judah, and six Gamaliel.

The Nasi had the right to appoint judges and the officers of the congregation. In the meetings of the Sanhedrin he occupied the highest seat, while the chief members of the body, probably 70 in number, were seated in a semicircle about him. Behind these stood the pupils, and at the extreme right the people were permitted to stand. The Nasi also fixed the dates of the festivals, which were based on the course of the moon, and presided over all the deliberations of the Sanhedrin. The office of Nasi came to an end about 425, when the Roman Emperor Theodosius abolished the patriarchate after the death of the last Gamaliel.

A. SH.

See Grætz, *History of the Jews*, 1926.

**NASIR KHOSRAU** (1004-1080), Persian poet and physician, was born at Kubadiyan, near Balkh, in Khorasan 1004. A student of medicine, science and philosophy, and a contemporary of AVICENNA, famous Arabian philosopher, he incorporated the latter's doctrines in his *Book of Enlightenment*, 1049. *Safarnama*, an account of his travels, is an epitome of the Mussulman world of the 11th century. *The Book of Happiness* deals allegorically with the ladder of divine wisdom and the ascent to spiritual bliss. Nasir Khosrau spent the last quarter of his life as a hermit at Yumgan, attracting many adherents, and died there in 1080.

**NASKAPI**, a tribe of the northeastern division of the North American Indian Algonkian linguistic stock. They occupy the interior of Quebec and the Labrador Peninsula, north of the Gulf of St. Lawrence, and from Lake Mistassini to Ungava Bay, in northern Canada, being neighbors of the Eskimo. They have traditions of having been driven to their present habitat from a more westerly position by the Iroquis. They are nomadic hunters, making periodical visits to the trading posts to barter their furs for white man's food and utensils. They wear tailored skin clothing, often elaborately painted, though the costume is frequently now modified by clothing bartered for at the trading posts. Transportation is by birchbark canoe in summer and by sled, toboggan and snowshoes in winter. Their utensils are of birchbark or wood, both usually sewed with roots. The Naskapi anciently practiced tree burial.

**NASSAU**, chief seaport of New Providence Island, in the West Indies, and capital of the British Bahamas. It is situated on a declivity near the northern coast and is fortified and well-built. Besides the governor's beautiful mansion, the city has stately administrative buildings, a public library, a hospital and some barracks. The harbor is well sheltered and considerable trade is carried on in sisal, raw tomatoes, sponges, cotton, fruit and salt. An Anglican bishop has his see in Nassau. It is a favorite winter resort. Pop., 1921, 10,225.

**NAST, THOMAS** (1840-1902), American caricaturist, was born at Landau, Bavaria, Sept. 27, 1840, coming to New York in 1846. He worked on *Leslie's Illustrated Newspaper*, *Harper's Weekly*, and in 1860 joined Garibaldi in Italy as artist for several newspapers. His cartoons in *Harper's* during the Civil War and Reconstruction period attracted great attention. Later Nast helped to break up the Tweed Ring. The Tammany tiger, Republican elephant and Democratic donkey are his originations. Also a clever painter, his *Head of Christ* hangs in the Metropolitan Museum, New York. Nast became American Consul General at Guayaquil, Ecuador, in 1902, and died there Dec. 7, 1902.

**NASTURTIIUM**, the gardeners' name for various species of *Tropæolum*, smooth, often climbing herbs, called also Indian cress. The commonly cultivated garden nasturtium (*T. majus*) is a tender, somewhat succulent annual with large, long-stemmed, peltate leaves and yellow, red, scarlet and varicolored flowers, 1 to 2½ in. broad. The lesser nasturtium (*T. minus*) has smaller flowers, more or less blotched and marked with dark lines. Both are native to South America, though the garden nasturtium now usually grown is regarded as a cultigen. Under the less common name Indian cress, the flower buds and also the young seeds are used to give pickles a piquant flavor.

**NASUMI**, the name of an extinct North American Indian tribe or village belonging to the Kusan linguistic stock. The village was on the south side of the mouth of the Coquille River on the coast of Oregon.

**NATAL**, the smallest province of the UNION OF SOUTH AFRICA, located on the southwest coast with a seaboard of 180 mi. on the Indian Ocean. It is bounded by the Cape of Good Hope on the southwest, and the Transvaal and Orange Free State on the northwest. Area 35,284 sq. mi.

The country, with an average width of about 150 mi., rises from the ocean to the divide made by the Quathlamba and Drakensberg mountains. The rise is extremely steep, for Pietermaritzburg, only 40 mi. from the sea, is over 2,000 ft. above sea level. The numerous rivers run through the country at right angles to the coast. North of the Tugela lies Zululand with relatively few rivers. The narrow coastal plain, the warmest belt, has a heavy summer rainfall and many fertile areas producing crops tropical in character. The midlands rising to 5,000 ft. and warm-temperate in climate, have pasture and important forest areas planted with wattle, a species of acacia which not only yields tanning extract but also timber for the mining districts. The highlands constitute a cool-temperate region with green pasture nearly all year round. These three physical divisions are separated by well-marked terraces.

Maize is the principal grain crop. Sugar cane is grown in many plantations operated by Europeans, and dairy farming is important. Tea is grown to some extent and prepared at DURBAN, the principal

port. Pietermaritzburg constitutes the administrative center of the province. Newcastle is the principal colliery town, with iron-smelting works.

Gold has been mined, but the principal minerals are now coal and ironstone.

In 1928 there were 192 schools for children of European extraction, 628 native institutions for colored children, and 255 schools of agriculture.

The first settlers were Dutch Boers who came from Cape Colony in 1839. Natal was annexed to Cape Colony in 1844, but in the following year was allowed a separate government, and was made a distinct colony in 1856. The province of Zululand was annexed to Natal in 1897 and three former districts of the Transvaal in 1903. Seven years later the colony was merged in the Union of South Africa. Pop. 1921, 1,429,398, classified officially as 136,838 Europeans, 11,107 mixed resulting from marriages between white settlers and natives, 1,139,804 natives and 141,469 Asiatics. Est. pop., 1930, Europeans, 176,061.

**NATAL**, a Brazilian seaport and capital of the state of Rio Grande do Norte, situated at the mouth of the Rio Grande do Norte, 135 mi. north of Pernambuco with which it is connected by rail. It is frequently necessary to dredge the harbor which is formed by the estuary to facilitate the entrance of coastwise vessels. Cotton is the city's chief export, and the manufacture of textiles its principal industry. Sugar, spirits, wax from the carnauba palm, and the by-products of coconut oil are also exported. Pop. 1920, 30,696; est. pop. 1930, 41,747.

**NATAL GRASS** (*Tricholena rosea*), a valuable forage grass native to South Africa and extensively introduced in Florida. It is grown also for its beautiful purple flowering-panicles used in winter bouquets.

**NATAL-PLUM** (*Carissa grandiflora*), a spiny shrub of the dogbane family, native to South Africa and cultivated in mild climates for its edible fruits. It grows sometimes 18 ft. high with spreading stems, ovate leaves, and large fragrant white flowers. The fruit, a large, scarlet, pulpy berry with papery seeds, is used for jellies and preserves.

**NATCHEZ**, a North American Indian tribe, a member of the Muskogean linguistic stock. They formerly occupied the territory on and near St. Catherine's Creek, east and south of the modern city of Natchez, Miss. Though originally the name of a single town, Natchez now includes peoples conquered by the Natchez and also refugees, like the Tioux and Grigra, under their protection. Three disastrous wars with the French in the early 18th century ended in the division of the Natchez into three groups: one group took refuge with the Chickasaw; another went to South Carolina, and then to the Cherokee country; and the main body settled on Tallahassee Creek, a branch of the Coosa River. Some remnants of the tribe thus scattered now live with the Cherokee in Oklahoma. In aboriginal days the Natchez were peaceable, sedentary agriculturists who made fine pottery and had well-developed weaving techniques, producing textiles from the inner bark of the mulberry.

They appear to have had also well-developed religious rituals. The chief was all powerful. The Natchez were divided into two exogamous phratries and further into four ranks of varying importance. They practiced head flattening.

**NATCHEZ**, a city of southwestern Mississippi, the county seat of Adams Co., situated on bluffs 200 ft. above the Mississippi River, about 90 mi. below Jackson and 200 mi. north of New Orleans, La. The Illinois Central, Missouri Pacific, Louisiana and Arkansas and Mississippi Central railroads, besides buses, river steamers and ferries to Vidalia, La., afford transportation. To-day Natchez is a trading center for a farming, stock-raising and lumbering region. Its industries include meat packing, canning, cotton milling, box making and sawmilling. In 1929 the retail trade amounted to \$6,936,700. A Confederate Memorial Park is located here, and three other beautiful parks overlook the river.

**History.** The oldest city on the Mississippi, Natchez has a history carrying it back through the rule of four nations. The first settlement was made on July 26, 1716 when Ft. Rosalie was established on the site in the name of Louis XIV, King of France. The building of the fort was the beginning of the destruction of the Natchez Indians; after a massacre in which more than 700 whites were killed, the French from the fort drove the Indians away from the Natchez country into the Red River region. In 1763 a treaty with France gave Great Britain possession of Ft. Rosalie, but in 1779, an expedition under Don Bernado de Gálvez, Spanish governor of the Louisiana territory, captured the city. In 1798 the Spanish garrison evacuated the town, and the American forces came into possession.

The Natchez Trace (now a part of Federal Highway 61), the oldest highway in America, terminated at Natchez, and during the early days of the settlement, its lonely stretches infested with Indians and highwaymen, it was the link between the Atlantic seaboard and the frontier outposts of the southwest. Along the waterfront of Natchez and under the bluffs was the part of the town known up and down the Mississippi as "Under the Hill"; in the days of the French and Spanish settlements, Under the Hill was a wide open town inhabited by flatboatmen, gamblers, freed slaves, half-breeds and renegade whites.

Natchez, where Jefferson Davis was a student and where he lived and married, flew the flag of the Confederacy for four years. For a while during the Civil War, Gen. U. S. Grant had his headquarters here. Andrew Jackson's plantation home was near Natchez, and there he married Rachel Robard. Aaron Burr's dreams of an American empire ended when United States troops arrested him near Natchez. The city was incorporated in 1803. Pop. 1920, 12,608; 1930, 13,422.

**NATCHITOCHES**, a city in northwestern Louisiana, the parish seat of Natchitoches parish, situated on Cane River Lake, 71 mi. southeast of Shreveport. The main line of the Texas and Pacific Railroad and

bus and truck lines serve the town. Cotton, corn, sugar-cane, peas and pecans grow in the district. The chief industries of Natchitoches are the manufacture of cottonseed-oil, syrup, lumber products, and the refining of coffee. It is the seat of a State Normal School. Natchitoches, the oldest settlement in the Louisiana Purchase, was founded by Louis Juchereaux de St. Denis in 1714. Chopin in Natchitoches Parish is the supposed scene of *Uncle Tom's Cabin*. Pop. 1920, 3,388; 1930, 4,547.

**NATHAN, GEORGE JEAN** (1882- ), American dramatic critic, was born at Ft. Wayne, Ind., Feb. 14, 1882, and educated at Cornell University and the University of Bologna, Italy. He entered journalism in New York City and in 1908 became dramatic critic for *Smart Set*. In 1914 he became joint-proprietor of this magazine with HENRY MENCKEN, with whom in 1924 he founded *The American Mercury*. Nathan is noted as one of the ablest and most incisive dramatic critics and among other books has written *Another Book on the Theatre*, 1916, *The Popular Theatre, The Critic and the Drama, The World in Falseface and Monks Are Monks*, 1929.

**NATHAN THE WISE** (*Nathan der Weise*), the title-character of a drama by LESSING. The character of the philosophical Nathan, one of the noblest Jews in literature, was based on that of Moses Mendelssohn.

**NATICK**, the name of an Algonkian Massachusetts Indian village founded by the Massachusetts after their conversion by the famous missionary, John Eliot, in 1650, near the present town of Natick, Mass. After King Philip's War it was the most important Indian village of the district. During the French and Indian War the Natick sided with the English. Later they were interbred with whites and Negroes. Early in the 19th century the last survivor of the group was murdered.

**NATICK**, a town including several villages in Middlesex Co., eastern Massachusetts. Natick village is situated at the southeastern end of Lake Cochituate, 18 mi. southwest of Boston and is served by the Boston and Albany Railroad. The town has various manufactures including shoes, boxes, corrugated paper and band saws. The factory output of Natick town for 1927 was worth \$4,775,899. Farming and horticulture are important, the cultivation of roses being a specialty. In 1650 a tract of land was granted to John Eliot for his "praying" Indians. It was called by the Indian name Natick, "hilly land" or "our land." Under the guidance of Eliot the Indians governed themselves according to Exodus XVIII, on a more or less "community plan." There is an Indian burial ground in the center of the town. A monument to John Eliot stands near the site of the Indian church. A copy of Eliot's Indian Bible is one of the town's valued possessions. Natick is the seat of the Walnut Hill School for girls. The town was incorporated in 1781. Pop. 1920, 10,907; 1930, 13,589.

**NATION**, a term most commonly used to denote a population inhabiting a specific unit of territory,

having a common language and literature, a common tradition and history, common customs and most important of all a common consciousness of unity. It is to be distinguished from a STATE in that the latter may be either narrower or broader than the former. The present state of Hungary does not include within its boundaries hundreds of thousands who believe themselves to be members of the Hungarian nation. On the other hand, within the British Empire are the Celts of Scotland and Wales, the French of Quebec and the Dutch of South Africa.

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**NATIONAL ACADEMY OF SCIENCES**, incorporated 1863 by Act of Congress "to advance science and especially to investigate, examine, experiment and report on any subject of science or art whenever called upon by any department of the Government." The academy has 10 standing committees: mathematics, astronomy, engineering, chemistry, geology and palaeontology, botany, zoology and anatomy, physiology and pathology, anthropology, and psychology. Besides \$5,000,000 which it received from the Carnegie Corporation of New York (see CARNEGIE TRUSTS) the academy has smaller trust funds to promote scientific research. Membership is limited to 300, of which 50 may be foreign associates.

**NATIONAL ANTHEM**, the patriotic hymn of a nation or country. In the Old and New worlds the most important national anthems are as follows: United States, *The Star-Spangled Banner*, 1814, words by Francis Scott Key, music by J. S. Smith; Canada, *The Maple Leaf Forever*; Mexico, *Mexicanos, al Grito de Guerra*; Great Britain, *God Save the King* (about 1740; sometimes attributed to Henry Carey); France, *Le Marseillaise* (1792, by Rouget de Lisle); Germany, *Deutschland über Alles*; Italy, *The Royal March*, by G. Gabetti; Spain, *Himno de Riego*, by Herta; Russia, Soviet anthem, *The Internationale*, words by E. Pottier; under the Czar, *Bozhe Zaria Chranj*; Austria, *Oesterreichische Bundeshymn*, by Renner and Kienzl; Belgium, *La Brabançonne*, 1830; Holland, *Wien Nierlansch*; Denmark, *Heil dir, dem Liebenden*; Sweden, *Ur Svenska Hjärtans*; Norway, *Ja, Vi Elsker Dette Landet*; Czechoslovakia, *Kde Domor Muj*; Bulgaria, *Shoumi Maritza*; Greece, *Ethnicos Ymnos*; Serbia, *Srpska Himna*; Turkey, *Istiklal Marsi*; China, *Song of the Kuomintang*; and Japan, *Kimigayo*.

**NATIONAL ASSEMBLY.** See FRENCH REVOLUTION.

**NATIONAL BANK ACT**, an act passed in the United States Feb. 25, 1863, authorizing the establishment of banks with a national charter and the privilege of issuing notes secured by United States Government securities. The primary object of the law was to increase the demand for government bonds, but the principal result was the improvement of the note circulation, previously consisting only of state bank notes, many of them of poor quality. The new law permitted banks to be organized with \$50,000 capital in towns of 6,000 population or less, banks of

at least \$100,000 capital in towns of 6,000 to 50,000, and banks of at least \$200,000 capital in towns of more than 50,000. An amount equal to one-third of the capital, or else \$30,000, was to be invested in United States bonds, and on deposit of these bonds with the Comptroller of the Currency in Washington, national bank notes were issued to the bank up to 90% of their value; in 1900, when bonds were selling well above par, to the full par value.

The reserve required of each bank depended upon the classification mentioned above. New York City was the only central reserve city until 1887, when Chicago and St. Louis were added. Their national banks were required to keep a reserve of 25% of deposits in lawful money, gold, silver and greenbacks. Eighteen of the larger cities of the country,—Albany, Baltimore, Boston, Charleston, Chicago, Cincinnati, Cleveland, Detroit, Leavenworth, Louisville, Milwaukee, New Orleans, Philadelphia, Pittsburgh, Richmond, St. Louis, San Francisco, and Washington—were named as reserve cities and required to keep a reserve of 25%, but half of this might be in the form of deposits with national banks in a central reserve city. Banks in the so-called country cities were required to keep a reserve of 15%, three-fifths of which might be kept as a deposit with a national bank in a reserve or central reserve city. The effect of these reserve provisions was to confirm the centralization of bank funds in New York which had existed even before 1863.

The national banking system had a rapid growth, and many state banks took out national charters. The largest and strongest banks of the country have been those in the national system, until the recent growth of strong TRUST COMPANIES outside the system. Since all national banks were required to join the FEDERAL RESERVE SYSTEM, they brought an element of strength into the Reserve System which it would otherwise have lacked. The organization of the Reserve System did however introduce into the national banking system a duality of control, examination and so forth, which must continue until the laws are unified.

The defects in the national banking system were chiefly the lack of elasticity in the form of circulating notes which it provided, and the general lack of control over the banking system which could not have been provided by any unit system of banks. The lack of elasticity was due to the fact that notes could not be issued until bonds had been bought, and notes printed, a process requiring two or three months and unadapted to meet either the strain of crop moving, or the unusual demand of a CRISIS. The same length of time was required to withdraw notes when the need for them was past, and there were, in addition, legal restrictions on the amount of such withdrawals.

The lack of centralized control and a central holder of bank reserves put the New York banks into the position of central reserve holders for the country, since the balance in New York could be counted as part of the legal reserves of national banks. There was a close connection between bank funds and the

CALL LOAN market, and whenever there was a financial crisis the banks tried to withdraw their funds from the call market in order to send back to bankers of the interior their reserves to meet the crisis at home. Frequently a complete tie-up of funds resulted, with the banks obliged to suspend specie payments, and the issuance of CLEARING HOUSE loan certificates for wages and other payments unobtainable. It was evident for many years that a thorough revision of the banking system was necessary, but the greenback agitation and the free silver movement (*see* BIMETALLISM) obscured the real causes of the trouble. It was not until after the panic of 1907 that the proponents of banking reform were able to gain serious consideration, with the FEDERAL RESERVE ACT as the result. B. H. B.

**NATIONAL BETTER BUSINESS BUREAU, INC.**, an organization in the United States which functions to "promote honesty, truthfulness and reliability in the sale of merchandise, securities and services, discourage fraudulent and deceptive methods in business and thereby to increase public confidence in advertising, salesmanship and business generally." It was first known as the National Vigilance Committee of the Associated Advertising Clubs of the World, having been organized under that name in 1912. There are 52 bureaus in the organization and their work is supported by several thousand newspapers, periodicals, industrial, financial and commercial organizations, government officials and chambers of commerce. The bureau is probably the most influential existing agency of business to assist itself in regulating its own affairs.

**NATIONAL BUDGET.** *See* BUDGET, NATIONAL. **NATIONAL BUREAU OF ECONOMIC RESEARCH**, an American organization founded in 1920 for the purpose of studying economic, social, and industrial problems. Their object, they state, "is to ascertain and to present to the public important economic facts and the interpretation thereof in a scientific and impartial manner, free from bias and propaganda." The Bureau is controlled by a board of 21 directors representing universities, learned and scientific societies, financial, industrial, agricultural, commercial, labor and technical organizations. A research staff is maintained but they may not publish their findings without the approval of the directors. The Bureau is in no sense run for the profit of its officers or members.

**NATIONAL BUREAU OF STANDARDS.** *See* STANDARDS, NATIONAL BUREAU OF.

**NATIONAL CITY**, a city in San Diego Co., southern California, situated 4½ mi. southeast of San Diego. The San Diego and Arizona and the Santa Fé railroads serve the city. Diversified farming is the leading interest of the region. The city has meat and citrus-fruit packing houses and a railroad tie treating plant. Pop. 1920, 3,116; 1930, 7,301.

**NATIONAL DEBT**, the financial obligation of a country or government. That of the United States is almost entirely a war debt. Prior to the World War, the highest total reached was \$2,756,000,000 on



June 30, 1866, shortly after the close of the Civil War. By the opening of the 20th century the amount of the national debt had been reduced below a billion dollars. In 1917, when the United States entered the World War, its debt started going up rapidly. The peak was reached on Aug. 31, 1919, when the gross debt outstanding totaled \$26,594,267,878. Since that time the debt has been reduced year by year until the total gross amount outstanding on June 30, 1930, was \$16,185,308,299.

The present outstanding debt consists of bonds issued prior to the World War, Liberty Bonds, Treasury bonds and notes, certificates of indebtedness, matured debt on which interest has ceased, and debt bearing no interest. Of the \$16,185,000,000 of debt outstanding on June 30, 1930, only about \$773,000,000 represents bonds issued prior to the World War. Bonds of the first and fourth Liberty loans are still outstanding, the other loans having been retired. The amount of the fourth Liberty loan is slightly in excess of \$6,268,000,000, while the first stands at \$1,934,000,000 in round figures. An extensive list of Treasury bonds and notes and certificates of indebtedness swell the total of interest-bearing debt, so that the final amount reaches \$15,924,000,000. Added to this interest-bearing debt is some \$260,000,000 of matured debt on which interest has ceased and debt bearing no interest, making the gross total of outstanding debt.

The interest rates on the national debt issues vary widely. Starting with 2% on the Consols of 1930 and the first two issues of the Panama Canal bonds, the rates mount up to 5½% on the series TM certificates of indebtedness of 1930. The only long term issues bearing more than 4% are the fourth Liberty loan, the convertible first Liberty issues, and one issue of Treasury bonds. These are redeemable at various dates from 1932 to 1952.

A law enacted on June 17, 1929 provides for a new form of government security. This law amends the Second Liberty Bond Act and authorizes the issuance of short term Treasury bills to be sold on a discount basis. Such bills are paid at maturity without interest and are offered for sale on a competitive basis. Two series of these bills were issued shortly after the law was enacted, one of \$51,316,000, maturing on July 14, 1930, and the other of \$104,600,000 maturing Aug. 18, 1930.

After the close of the World War, four main sources of funds were available for debt retirement, some of which have since been exhausted. These were the reduction of the cash balance in the Treasury from a war time to a peace time basis; large budgetary surpluses due to the continuing high rate of taxation; money received from foreign governments on account of their debts to the United States; and a sinking fund created by Congress for the purpose of retiring the debt. Of these sources, the first two are no longer applicable. The Treasury balance has been exhausted. It has generally been the policy of the administration to reduce taxation as conditions permitted, thus holding down the annual budgetary surplus to a mini-

mum. The two other important sources are the debt payments received from foreign governments and the sinking fund. The former is a more or less uncertain quantity, depending upon the form in which the payments are made and upon the general cash position of the Treasury. The latter, however, is a rather certain source, although its amount cannot be exactly foretold, since it depends upon the prices paid for bonds, the interest payment dates on the bonds, and the average interest rate on bonds retired. Judging from the amount of the national debt which has already been retired, it is reasonable to assume that the sinking fund, together with the moneys which become available from foreign debt payments, will provide for a rather steady reduction of the debt, that is, if no attempt is made to divert these sources to the financing of current deficits. President Hoover, in his budget message to Congress on Dec. 1, 1930, expressed himself as being opposed to any such diversion.

In 1931 agreements had been reached with most of the European nations indebted to the United States under which they will eventually pay over \$22,163,000,000, in liquidation of the principal and interest on loans resulting from the World War. About half of this amount will be for interest charges. The final liquidation will be accomplished over a period of 62 years. The average interest rates are around 3%, although large concessions have been made in some instances, notably in the case of Italy where the rate is fixed at slightly more than four-tenths of 1%.

A. E. B.

**NATIONAL DIVIDEND**, another name for the **INCOME** of its inhabitants. The term has been used in two senses, one inclusive of all product or **VALUE** created, plus imports, minus exports, in the country in a given year; the other restricted to goods and services, or their **MONEY** value consumed during the year. The latter is the sense in which the term should be used. Income is fundamentally a flow of consumers' utilities. Total consumers' income will equal total value of products and services produced during the year, only in case the total money income of consumers during the year is expended for the **CONSUMERS' GOODS** produced and available for **CONSUMPTION**. Any money income not thus eventually expended during the year—such as corporate surpluses and individual savings, whether made out of money wages, rents, dividends, interest or profits, limits by that much the demand for consumers' goods and thus limits the size of the real income of the country for that year. On the other hand installment sales, by mortgaging the money income of future years and delivering more consumer's goods than consumers' money income of that year could pay for, has the opposite effect.

A. B. W.

**NATIONAL EDUCATION ASSOCIATION**, **THE**, of the United States, an organization of teachers and others interested in the promotion of education. It was organized in 1857 as the National Teachers' Association and by Act of Congress adopted its present name in 1907. A delegate plan adopted in 1920 gives

the teachers of the country a voice in shaping its policies. The association has worked to raise the certification standards of teachers, to increase their salaries, and to create a Department of Education with a secretary in the President's Cabinet, and has promoted educational research.

**NATIONAL FINANCE.** See FINANCE; NATIONAL DEBT; BUDGET, NATIONAL.

**NATIONAL FORESTS,** areas set aside by the Federal Government primarily for timber conservation. They are administered by the forest service, a bureau of the department of agriculture created in 1905. There are 151 national forests (June 30, 1931) with a total net area of 160,787,687 acres of which 89.3% is in western United States. Alaska has two national forests with an area of 21,344,613 acres. Approximately 81,200,000 acres (1925 estimate) are true forest land containing magnificent stands of timber, the remaining acreage being woodland, brush and grass of more value for grazing and water protection than timber production.

**Administration.** The United States is divided into nine regions as follows: northern, Rocky Mountain, southwestern, intermountains, California, North Pacific, eastern, Alaska and the lake states region. Each region is superintended by a regional forester and each forest is superintended by a forest superintendent and is divided into districts which are under the direct charge of a ranger. On an average there is one ranger for every 50,048 acres.

**Fire.** Airplanes and lookout stations on high places keep vigilant watch for signs of fire. Approximately 50% of all fires are caused by lightning with careless smokers as the next big item. During the period 1925-29 but 33% of the national forest area was burned over as against 70% between 1910-14.

**Scientific Forestry.** A system of regional forest experimental stations cooperates with state foresters, forestry schools, state agricultural colleges and state experimental stations on all phases of forestry work, providing an invaluable nucleus for coordinating research data. An area of 21,678 acres within the forests was planted with young trees in 1930, making a total of 296,063 acres planted since the beginning of the service.

**Economic Use.** Timber is cut no faster than it will be replaced by growth in a tributary unit, thus providing a permanent lumber enterprise. In 1929 a total of 1,421,188,000 board ft. of timber was cut and sold. Approximately 12,900,000 head of live-stock of all ages are grazed annually. This figure includes over 6,500,000 sheep and goats, nearly 1,500,000 cattle, horses and swine and 4,900,000 young animals. Private development of mineral deposits and utilization of streams for water power is permitted.

**Recreational Use.** The national forests constitute one of the most important series of outdoor playgrounds available to the American public. Recreational use may be divided into three major forms, the most popular and extensive being that of general travel through the forests by campers, tourists, mountaineers,

fishermen, hunters and nature lovers generally. To provide this class with adequate camping facilities something over 1,500 campgrounds have been at least partially equipped. The second is that of occupancy for summer home purposes under special use permits. Over 10,000 such homes are maintained on national forest land. The third group includes over 1,000 hotels, resorts, and camps, operated by private parties, municipalities and organizations such as the Boy and Girl Scouts, Campfire Girls and similar groups. The forest service has cooperated in the building of almost 18,500 mi. of roads and 53,500 mi. of trails. A high point of 31,004,515 visitors to the national forests was reached in 1930. Of these over 16,000,000 visited California forests and almost 2,000,000 the White Mountain National Forest in New Hampshire.

**NATIONAL GALLERY, London,** one of the great art museums of the world, is located in Trafalgar Square, London. The gallery, established by Parliament in 1824, has a collection of more than 4,500 pictures, of which number 1,300 are on view in the 31 rooms of the gallery, the remainder being exhibited at the TATE GALLERY. The collection includes celebrated examples of the Italian, Spanish, Dutch, German, French, and English schools, and includes the "Madonna of the Rocks," attributed to Leonardo da Vinci, and other canvases by Michelangelo, Raphael, Titian and Rembrandt. The collection has been acquired by state purchase and by bequests, among the latter being the gifts of Robert Vernon in 1847, Wynn Ellis in 1876, Henry Vaughan in 1900, and that of George Galting in 1910.

**NATIONAL GEOGRAPHIC SOCIETY,** an American scientific society founded and incorporated in 1888 for the "increase and diffusion of geographical knowledge." It holds lectures weekly from November through April in Washington, and publishes the *National Geographic Magazine*. The society has financed many exploring expeditions. The Hubbard Gold Medal, awarded by the society for outstanding achievement in exploration or geographic discovery, has been given Robert E. Peary for his Arctic explorations, to Roald Amundsen for achieving the Northwest passage and locating the north magnetic pole, to RICHARD E. BYRD for first reaching the north pole by airplane and to CHARLES A. LINDBERGH for his solitary flight from New York to Paris and to AMELIA EERHART, the first woman to fly her airplane across the Atlantic.

**NATIONAL GUARD,** in the United States, the military forces of the states as organized under the National Defense Acts of June 3, 1916 and June 4, 1920. The National Guard has a dual function, first as the organized MILITIA of the states to which it pertains and second, as a component of the ARMY of the United States. In Europe the National Guard is associated particularly with French history, where it first appeared during the Revolution after the capture of the Bastille when volunteers enlisted to preserve law and order. As the revolt spread to the provinces, other cities followed the example of Paris and a sort of bourgeois police sprang up all over

France. On Aug. 10, 1789 the National Assembly passed a resolution creating them a National Guard under the authority and pay, not of the king, but of the municipalities. Under Lafayette's command it became a citizen army whose middle class character in the early days of the Revolution is attested by the fact that only "active" citizens could serve in the National Guard.

As the revolutionary spirit grew, it gradually permeated the Guard also. Hanriot succeeded to the command once held by Lafayette, and during the Terror it was used as a tool by the radicals. With the rise of Napoleon, the National Guard was dissolved and disappeared only to reappear in the national disaster attending his overthrow. During the Restoration period the National Guard again came into prominence on the side of the liberal bourgeois interests. In 1830 it became the mainstay of the monarchy of the middle class. But by 1848 it wavered in its loyalty to Louis Philippe. With the establishment of the Second Empire it was abolished.

**NATIONAL INSTITUTE OF ARTS AND LETTERS**, a society for the advancement of art, music and literature, organized in 1898 by men nominated by the American Social Science Association. The first president was Charles Dudley Warner. Membership is limited to 250 persons who are native or naturalized citizens of the United States and distinguished by some outstanding achievement in the arts. Vacancies are filled by a majority vote of the Institute membership. This society is the parent of the ACADEMY OF ARTS AND LETTERS organized in 1904, the members of which are chosen from those of the Institute.

Each year the gold medal of the Institute is awarded to a citizen of the United States for distinguished services to arts or letters in the creation of original work. It was first given in 1909 to Augustus Saint-Gaudens. Other recipients were James Whitcomb Riley, John Singer Sargent, John Burroughs and Eugene O'Neill.

In 1931 the National Institute membership included 19 in the department of music; 84 in the department of art; and 127 in literature. William Lyon Phelps was president.

**NATIONALITY**. Ethnologically nationality is the status of an individual with respect to his ethnic origin, as Greek, French or German, and people of the same nationality who speak the same mother tongue and have common literature and traditions as well as similar physical characteristics and social customs. The modern tendency in international establishment of geographical boundaries of states is to make them conform with the ethnological boundaries. This provides for ethnic homogeneity within the state, a most important factor in political unity and social harmony.

Legally, nationality is the quality of being a member of a particular state, irrespective of ethnic origin. In this sense it is sometimes, but not necessarily, synonymous with the term, CITIZENSHIP. Legal

nationality is determined by two different systems: place of birth (*jus soli*) and the nationality of the parents (*jus sanguinis*). Both United States and British nationality are based upon the *jus soli* principle but the *jus sanguinis* principle is also incorporated. Any person born in the United States is a national by right of birth and a child born abroad of a citizen father is likewise a national. Laws with regard to nationality vary in different countries, but the provision that a child is a national when born within the state of parents who are citizens of the state is common to all. It sometimes happens that a child is a national of two states by birth, but place of future residence is usually the determining factor in such cases. In addition to being born citizens, individuals may become nationals of a state by NATURALIZATION, in which case they give their oath of allegiance. Citizens may lose their nationality through extended foreign residence and sometimes, in the case of women, by marriage to a foreigner.

Nationality is, as it were, a mutual benefit institution. The individual is entitled to protection at home and abroad by the state to which he belongs, and, in turn, the state may demand his allegiance and service in time of war.

**Nationalism**. In the 18th century, oppression under the dynasties and empires of Europe gave rise to patriotism for ethnological nationality, the original nationalism. These early nationalists were liberalists, desiring freedom and the opportunity to preserve and use their mother tongue, traditions and customs. The following centuries have witnessed the downfall of the old political order and the establishment of nations whose geographical boundaries for the most part conform with their ethnological outline. But this change has been accomplished through war and sacrifice which have left the nationalities with histories and traditions that are largely militaristic and with tendencies that are somewhat imperialistic. Thus, nationalism has evolved from the liberal creed of the oppressed to the almost exact opposite in some instances, notably in Italy. The effects of this new order of nationalism on society are, according to Carlton J. H. Hayes, exclusiveness, jingoism, intolerance at home, imperialism abroad, patriotic gullibility and docility and a patriotic emotionalism akin to the religious emotionalism of the middle ages.

**NATIONALIZATION**, the assumption by a central governmental agency of the ownership and ordinarily of the control of social resources for the public welfare. It is distinguished from state or municipal ownership only in the unit of administration of the publicly owned property.

Nationalization is favored by differing reform organizations. The single-tax followers of HENRY GEORGE propose the nationalization of land. Socialists and Communists (see SOCIALISM and COMMUNISM) suggest the abandonment of private property in the essential means of production and distribution in favor of nationalization. More conservative groups, such as the Public Ownership League of America (Chicago)

hold that social ownership be extended only to the fields of public utilities,—power plants, water works, gas companies and railways. The United Mine Workers, through a committee, framed in 1922 a plan for the nationalization of mines.

Many advocates of nationalization urge the confiscation of properties taken over while others suggest the indemnification of holders. In Soviet Russia and to a great extent in Vienna, the former practice has been in vogue. In Great Britain, Germany and the United States, the latter method has been generally employed. Opinions also differ as to the means of administration of nationalized properties. The increasing tendency is toward the establishment of governmentally-owned CORPORATIONS to take over newly-acquired industries. Such corporations are operated by directors who hold office for a long term. In some cases, provision is made for representation of workers or consumers on the board. The merit of such a system, it is urged, lies in the avoidance of bureaucracy and the assurance of cooperation and participation by each interested group.

Critics of public ownership appeal for the preservation of rugged individualism and initiative, holding that public ownership tends toward inefficiency.

Even before the World War the movement toward public ownership had made great strides. Government ownership of railways predominated, except in Great Britain and the United States. Communication services—especially the carrying of mail—were also generally under governmental auspices. Public ownership was also making inroads in the following fields—street railways, light and heat, public health, insurance, banking and forestry.

The movement toward nationalization was accelerated during the World War for military reasons. Many agencies set up at that time survived the post-war reaction. Moreover, the rebellion of the peasantry (*see* PEASANT), against age-old Feudal holdings lent support to the movement toward socialization of land values. And the difficult post-war readjustments in industry and mining caused organized workers to press claims for the liquidation of incomes based only on traditional property rights. Nationalization has been most extensively adopted in Soviet Russia where it is the keynote of the economy. In Germany and Great Britain, substantial strides have also been made.

In the United States and Canada, a somewhat different tendency has set in. Though public ownership has predominated in the furnishing of water supplies, other PUBLIC UTILITIES have, in the main, been under private ownership. American railways are under private control and management despite a war experience in Federal control which was, for the purposes intended, highly satisfactory. The post office, the Panama Canal and the administration of governmental services in Alaska and in the Colonies are noteworthy national enterprises. The American public domain which is valued at \$26,000,000,000 includes valuable forests and water power rights.

Perhaps the most spectacular North American un-

dertaking has been in Ontario Canada, where the Province has launched a large hydroelectric power project which has been able to supply power to domestic consumers for less than two cents a kilowatt hour.

C. E. W.

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**NATIONAL LABOR REFORM PARTY**, the first labor party in the United States participating in a presidential election (1872). It was the political expression of the National Labor Union, organized in 1867, and had Socialist support. Its first and only national nominating convention, at Columbus, O., Feb. 21-22, was attended by delegates from 17 states. The party nominated for president Charles O'Connor, prominent lawyer of New York City. O'Connor, supported also by the STRAIGHT DEMOCRATS, polled 21,559 votes. Richard F. Trellick of Michigan and other leaders of the party attributed its disruption to the intrigues of corporations and old-line party bosses.

**NATIONAL MONETARY COMMISSION**, a body in the United States appointed by a joint resolution of the Senate and House of Representatives in 1908 to inquire into, and report to Congress at the earliest date practicable, what changes are necessary or desirable in the monetary system of the United States, or in the laws relating to banking and currency. It consisted of nine members of the Senate, nine members of the House under the chairmanship of Senator NELSON W. ALDRICH, a secretary, and a special assistant. Hearings were held both in the United States and abroad, special reports were required of the national and state banks, and important foreign documents were reprinted. The whole report comprises nearly forty volumes, published as a Senate document.

This investigation was the direct outcome of the panic of 1907, and the material which it provided served to some extent as a basis for the reform legislation of 1913 which established the FEDERAL RESERVE SYSTEM. It is the most complete survey of the American banking system ever attempted. B. H. B.

**NATIONAL MONUMENTS**, areas reserved because of their historic, prehistoric, or scientific interest. With the exception of the George Washington Birthplace, which was established by act of Congress, they have been established by presidential proclamation under the authority contained in the Congressional Act of June 8, 1906, "for the preservation of American Antiquities." Of the 71 national monuments (Oct. 1, 1931), 34 are administered by the National Park Service, a bureau of the department of the interior; 16 by the department of agriculture and 21 by the war department. Four are in Alaska. The national parks and monuments are closely allied. In general the distinction lies in the fact that the parks are distinctly scenic regions.

The national monuments may be divided into four general groups: prehistoric, historic, geological and biological. In the prehistoric group, including Casa Grande, Aztec Ruins, Montezuma Castle, Tonto and

Walnut Canyon, are found the ruins of the habitations of peoples who lived within the boundaries of the present United States before the coming of the white man and of whom nothing is known beyond what can be pieced together from such evidence as the type of houses they built and the artifacts they left behind them. The historic group comprises sites of importance in the early history of the West such as Scott's Bluff in Nebraska, Verendrye in North Dakota, ruins of the early Spanish missions of the Southwest at Gran Quivira and Tumacacori, and the ruined old Mormon fort at Pipe Spring. Also within the historic group come the monuments administered by the war department with the notable exception of Mound City, a famous group of prehistoric mounds within Camp Sherman Military Reservation. In addition to forts and battlefields the monuments under the jurisdiction of the war department include Abraham Lincoln's Birthplace; Kitty Hawk, which is the site of the Wright Brothers' famous flight, and the Meriwether Lewis National Monument containing the grave of Captain Lewis of the Lewis and Clark Expedition. The geological include regions containing volcanic phenomena such as Katmai, Capulin Mountain, Craters of the Moon, and Devil's Tower; petrified trees in the Petrified Forest, petrified plants in Fossil Cycad; strikingly eroded rocks such as are found in Chiricahua, natural bridges, arches, and pinnacles; remarkable limestone caverns at Timpanogos, Jewel and Lehman caves and the fossil remains of prehistoric reptilian life at Dinosaur National Monument. Of the biological national monuments, Muir Woods was established to preserve a remarkable growth of trees and Mount Olympus to preserve the rare olympic or Roosevelt species of elk from extinction.

The monuments in the Southwest have a permanent park naturalist who also serves as guide. Many have museums containing exhibits of objects excavated from the grounds. Ruined structures within the monument areas are being repaired and restored in so far as funds permit. The 34 national monuments administered by the National Park Service had an estimated attendance in 1931 of 392,011. Visitors to the 18 Southwest monuments totaled 192,096 in the same year. Free camping grounds for tourists are maintained in many of the national monuments and roads or trails lead to important features. They are sanctuaries for wild life and hunting is forbidden at all times.

**NATIONAL PARK-TO-PARK HIGHWAY,** the pageant highway of western United States, connecting 12 national parks within a distance of 6,000 mi. Its course is a panorama of natural splendors including skyscraper mountains, painted canyons and deserts, boiling geysers and high waterfalls. Starting at Denver, it proceeds to Rocky Mountain National Park where the towering snow covered mountains are the chief attraction; from here it runs 620 mi. to Yellowstone Park, a museum of natural phenomena famous for its giant geysers. The road then leads

411 mi. to Glacier Park, so called for its glacier clad mountains, and from Glacier it runs westward 731 mi. to Mt. Rainier, the third highest peak in the United States. Here the highway starts southward along the coast, passes through Seattle and Portland, and after 646 mi. reaches Crater Lake, an extraordinary blue sheet of water contained in the crater of an extinct volcano at an elevation of 6,239 ft.

The next point is 313 mi. distant at Lassen, the only active volcano in the United States. From here the road runs 492 mi. to the world famous Yosemite Valley with some of the highest waterfalls in the world; and continues southward 254 mi. to Grant or Sequoia Park noted for its giant trees. After reaching Los Angeles the highway crosses the Mohave Desert to Zion Canyon in southwestern Utah, a distance of 857 mi. From this point it is 593 mi. to the magnificent Grand Canyon of the Colorado River in Arizona and 591 mi. more to Mesa Verde, the home of the prehistoric cliff dwellers. The distance between the latter point and Rocky Mountain National Park is 592 mi. The highway has been improved by paving or grading, and the trip may be made in 90 days, allowing time for sightseeing and stopovers.

**NATIONAL PARKS,** areas set aside by Congress for all time for the use and enjoyment of the people. There are 22 national parks covering a total area of 12,542.46 sq. mi. These include one in Alaska, one in Hawaii and the Great National Park in North Carolina and Tennessee which was established by act of Congress Aug. 28, 1930. Although development of the area within the Great Smoky Mountains National Park may not be undertaken until a minimum of 427,000 acres within the prescribed boundaries has been tendered to and accepted by the government for park purposes, the National Park Service was charged with the administration and protection of a minimum of 150,000 acres when that amount had been accepted by the government. Deeds covering 297,719.70 acres have been turned over to the United States (1931) and a small administrative staff has been installed for the administration and protection of the area. The wonders of the Yellowstone country led to its establishment as the first national park in 1872 and each successive park area has been set aside because of extraordinary scenic beauty, remarkable natural phenomena or other unusual features.

**Administration.** The parks are administered by the National Park Service, a bureau of the department of the interior with headquarters at Washington, D.C. There are four major branches of the service, use, law and regulation, lands and education. A resident superintendent is in charge of each park.

**Conservation.** It is the purpose of the Service to preserve each park in a state which approximates as nearly as possible its condition when first seen by white men. No extraneous plants or animals are being introduced and every possible effort is being made to encourage the natural flora and fauna of each individual region. Herds of deer, elk, antelope, buffalo, mountain sheep, moose and other animals are

flourishing in various parks under the careful supervision of the rangers. Hunting is absolutely prohibited and the refuge thus offered is the only hope of preserving some species from extinction as, for example, the trumpeter swan, the largest American waterfowl, of which there are still a few individuals in Yellowstone. No logging is permitted within park boundaries. Fish hatcheries which replenish the streams of several parks are maintained in Glacier and Yellowstone.

**Educational Activities.** All educational and research work in the parks, including nature-guides, lectures and museums, is supervised and coordinated by the education branch of the National Park Service. In many of the parks trained naturalists give lectures and also conduct trips which vary from a few hours' hike to horseback or automobile trips of several days' duration. Auto caravans of private cars under the guidance of a park naturalist have long been a feature of Mesa Verde National Park and were introduced in 1930 with great success in Yosemite, Yellowstone, Sequoia and Grand Canyon Parks. Museums in several of the parks illustrating their geological, paleontological, or archeological significance are an important educational development.

**Private Holdings.** Land within the gross area of the parks owned by private parties in 1931 totaled 27,526.49 acres. These private holdings constitute a great fire hazard and complicate administration problems. Frequently they are not properly kept up and become unsightly and the possibility that they may be cut over and thus ruin the general appearance of the park is a constant menace. Congress has provided funds for the purchase of these areas with the provision that they be matched on a 50-50 basis by private donations. During 1929 more progress was made in eliminating these holdings than at any time in the past, the most important purchase being that of 15,570 acres in Yosemite at a cost of \$3,300,000 of which one-half was donated by John D. Rockefeller, Jr. Private holdings in Glacier National Park totaling 7,160.57 acres comprise the greatest acreage of any of the parks.

**Recreational Use.** All parks within the boundaries of the United States proper are on or near railroads and are also easily reached by good automobile roads from other parts of the country. Within the parks themselves are excellent systems of automobile roads and extensive systems of foot and horseback trails. Hotels or lodges and in instances both are maintained in all parks and free automobile camp grounds are available for visitors bringing their own camping equipment. Some of the parks have house-keeping cabins for rent within these camp grounds. Increasing winter use is an interesting phase of national park development. In 1930-31, by the maintenance of all-year approach roads and the establishment of winter accommodations and equipment, 12 parks were accessible to the traveling public. Yosemite, Mr. Rainier, Sequoia, General Grant and Rocky Mountain specialize in winter sports. During the last

few winter seasons from 75,000 to 100,000 visitors came to Yosemite. It is estimated that whereas in 1920 somewhat over 919,504 people visited the 19 National Parks (no figures available for Hawaii and Mt. McKinley), in 1931 over 3,152,845 people and 897,038 automobiles visited the 22 national parks.

**NATIONAL PHYSICAL LABORATORY**, the national standardizing and research institution of the British government. Its duties consist primarily of verification of standards, pioneer work in the nature of investigations of scientific and industrial problems, the examination of the properties of substances under all conditions, the precise determination of physical constants, the testing of instruments, constructional work and the designing of new and more perfect instruments. The laboratory is located at Teddington, England. It started on a small scale, but it has developed to an institution of considerable importance in the British scheme of industrial advancement. It has been the instrument which has brought about co-operation between the pure sciences and their industrial applications. England was moved to the establishment of the National Physical Laboratory through the success of its predecessor, the *PHYSIKALISCH TECHNISCHE REICHANSTALT* of Germany.

**NATIONAL PIKE.** See CUMBERLAND ROAD.

**NATIONAL POLICY**, in Canadian history, the composite of political issues strenuously advocated by John A. Macdonald and other Conservative leaders after 1876. Upon this set of issues the Mackenzie Liberal administration was overthrown in the elections of 1878. "National Policy" was essentially a demand from patriotic motives for protective tariff. Protection of Canadian industries was desired to enable Canada to become a self-sufficing nation; and to force the United States to bargain for commercial concessions. Intimately connected was a plan of internal improvements, to develop a system for the transportation of Canadian products to the sea, and to stimulate westward expansion.

**NATIONAL REPUBLICAN PARTY**, the name assumed by the faction of the old DEMOCRATIC-REPUBLICAN PARTY led by Henry Clay and John Quincy Adams, 1824-31. It advocated a strong national bank, a system of internal improvements to be undertaken by the National Government, and a protective tariff (see CUSTOMS DUTIES). The party stood for a reaffirmation of commercial interests, practically voiceless since the collapse of the FEDERALIST PARTY, and contemporaneously an affirmation of the nationalist tendencies of the West. Its strongest opposition was the more democratic faction led by Andrew Jackson. The principles of the National Republicans became the nucleus of the WHIG PARTY.

**NATIONAL RESEARCH COUNCIL**, organized in 1916 by the NATIONAL ACADEMY OF SCIENCES as a measure of strengthening national defense and promoting national welfare. After the war it was changed into a permanent organization for promoting research in physical and biological sciences and dissemination of scientific knowledge for the benefit of

the nation. The members of the council are representatives of national scientific societies, other research organizations, Government representatives and others who may advance the work of the council.

**NATIONAL UNIVERSITY**, a coeducational institution of higher learning at Washington, D.C., established in 1869. While the institution is primarily a law school, it maintains also a department of arts and sciences, and a graduate school. The library contains 5,000 volumes. In 1931-32 there were 1,200 students and a faculty of 86 headed by Chancellor Charles F. Carusi.

**NATIONAL UNIVERSITY**, a proposed Federal institution of learning whose establishment at Washington, D.C., has been advocated without result since the early history of the United States. It was first suggested by George Washington, who left property toward the endowment of such an institution, on the condition that Congress would extend aid to the university. This aid has never been given. The plan has been advocated by several presidents, and by many prominent educators. More recently the idea has been not to establish a university in the usual sense, but to organize systematically the facilities now existing in Washington, and to form a purely graduate institution, which will cooperate with the scientific departments of the Federal Government, and promote the advance of science, pure and applied, the liberal and fine arts, and the national welfare.

**NATIONAL WEALTH**, consists of the sum total of the ECONOMIC GOODS existent at a given time within the national boundaries, whether owned by individuals, private CORPORATIONS, or collectively by the people through various governmental agencies. From this total should perhaps be deducted the WEALTH owned by foreigners abroad and the INCOME of which goes to them, and to it added the wealth owned abroad by citizens of the nation in question. Mere evidences of ownership, such as shares of stock, should not be counted; that would count the same wealth twice. The prosperity of a nation depends both on its accumulated wealth and on its natural resources, some of which are free goods—for example, climate, rivers and harbors in their natural state and sea fisheries. Broadly, these are sources of prosperity, but they cannot technically be called wealth. The same holds true of POPULATION, which some writers, more romantic than scientific, have regarded as national wealth, and of the people's knowledge and aptitudes. Since wealth consists of so many diverse kinds of goods, the only quantitative measure of national wealth is its monetary value. Such an estimate is based on the hypothesis that the wealth could be sold in the MARKET, which is to some extent an unreal hypothesis. Moreover the monetary value of national wealth can be estimated for a large country like the United States only within limits of accuracy which involve a margin of error of hundreds of millions, probably billions, of dollars. A. B. W.

**NATIONAL WORKSHOPS**. The idea of national workshops was developed by Louis Blanc in

his *Organization of Labor* published in 1839. He advocated replacing of private industry with national workshops organized by the state with state funds. Gradually the workers were to take them over, choose their own managers and foremen, develop the industries and divide the profits. At the beginning wages were to be determined in accordance with work done, but as the workmen became educated wages were to become equal. In 1848, after the overthrow of the July Monarchy in February, the Socialists and Republicans were sufficiently strong to obtain recognition. The Provisional Government decreed, Feb. 26, "the immediate establishment of national workshops." But Marie, the minister of public works, was entirely hostile to the idea as was most of the rest of the Provisional Government. The result was a travesty on the plan of Louis Blanc. Only in the leather industry was any attempt made at organizing the workshops on the basis of a particular industry. For the most part, the so-called national workshops were nothing more nor less than a "workshop" army of every trade and occupation set to digging trenches at .40 a day. In April over 100,000 workers were employed in this manner despite Blanc's protests. With the shortage of funds the working days were reduced to two a week, and early in May the so-called workshops were abolished altogether.

**NATSITKUTCHIN**, one of the North American Indian Kutchin group of the northern division of the Athapaskan linguistic stock. They occupied the territory from the Porcupine River to the Romanzof Mountains in Alaska. They are nomadic hunters, hunting the caribou chiefly, and are the principal trading intermediaries with the Kangmaligmiut Eskimo.

**NATTY BUMPO**, another name for the hero of five novels by J. F. COOPER. See LEATHERSTOCKING.

**NATURAL BRIDGES NATIONAL MONUMENT**, created by presidential proclamation Apr. 16, 1908 and enlarged to its present size of about 2,740 acres, Feb. 11, 1916, is situated in San Juan Co., southeastern Utah. The monument contains three natural rock bridges which are among the largest of their kind. The Owanchomo, better known as the Edwin Bridge, has a span of 194 ft. and rises 108 ft. above the stream bed of an unnamed canyon at its conjunction with Armstrong Canyon. It is the smallest of the three bridges and also is probably the oldest, as its arch has been eroded away until it is 35 ft. wide on top and but 10 ft. thick in the center. Three miles down Armstrong Canyon is the massive Katchina or Caroline Bridge which rises 205 ft. above the stream bed and has a span of 186 ft. Its arch has a minimum thickness of 107 ft. In White Canyon about 2½ mi. from the Katchina Bridge is the Sipapu or Augusta Bridge, the largest of them all. It has a span of 261 ft. and rises 222 ft. above the stream bed. Blanding, Utah, about 55 mi. east of the natural bridges, is reached by automobile routes from Mesa Verde National Park in Colorado or from Thompson Utah. An automobile road from Blanding goes to within a quarter of a mile of the Edwin Bridge.



## NATURAL GAS—NATURALIZATION

**NATURAL GAS**, a normally inflammable gas obtained from certain rock formations in which it usually occurs associated with **PETROLEUM**. Where it is found abundantly near populous centers it is much in demand for heating and lighting, but where found in oil wells distant from pipe-line connections it is often allowed to run to waste. Natural gas usually consists mostly of **METHANE**, or marsh gas, a hydrocarbon belonging to the paraffin series, with the formula  $\text{CH}_4$ . The exact constituents vary in different fields, and other paraffin gases are often present. Hydrogen is sometimes found as is carbon monoxide. Non-combustible gases occasionally contaminate the natural gas, such as nitrogen, carbon dioxide and **HELIUM**. The latter was wasted for many years, until it was discovered to be an excellent substitute for the inflammable hydrogen in balloons and dirigibles.

When natural gas contains such members of the paraffin series as pentane, hexane and heptane, in amounts of about half a gallon per 1,000 cubic feet or more, they are extracted to make casing-head or natural gas gasoline. These are known as wet gases, while those not containing enough for profitable extraction are called dry gases. The former are usually found in fields also yielding oil.

In origin, natural gas is intimately connected with petroleum. Both are derived from organic remains, mostly of marine plants, accumulated in the shallow water of near-shore regions where they become intimately mixed with the fine **SILTS** commonly deposited there. The partial decay brought about by the attack of anaerobic bacteria on the organic material produces **KEROGEN**. This is a yellow to brown carbonaceous material found as globules and laminae in so-called oil shales. When it is subjected to heat and pressure during compaction by overlying sediments, or by crustal movements involving the squeezing of the associated rocks, oil and gas are apparently distilled, leaving behind a carbon residue. The squeezing process is assisted by the water in the **SHALES**, as it has a stronger capillary attraction than oil or gas, and so displaces them from small pore openings. They are thus forced into more porous rocks, such as **SANDSTONE** and cavernous **LIMESTONE**. In these, circulation is freer and the gas tends to rise to the surface. Thus, unless trapped, it will escape. Favorable situations for its entrapment are provided where porous "reservoir" rocks are domed up and capped by an impervious bed, such as shale. Other structural irregularities, such as **DIKES**, salt domes, barriers of finely comminuted rock, or clay gouge, in **FAULTS**, which cut across the reservoir rock and prevent further migration of gas, are favorable for its accumulation. From such situations it is extracted by **DRILLING** holes a few inches in diameter through the superincumbent rock-formations, and allowing the gas to escape into pipe-lines. Great pressures are not infrequently encountered, which cause difficulties in controlling the gas wells.

The geological and geographical distribution of gas is similar to that of petroleum. Occasionally gas pools

are found which are not associated with oil, and small amounts often occur with coal. The United States produces about 98% of the world's natural gas, mostly from the Appalachian, Oklahoma, Kansas, Texas and Louisiana fields. In 1915 its production was 629 billion cubic feet; in 1928 production amounted to 1,568 billion cubic feet. Canada holds promise of future production, and some natural gas has been utilized in Russia, Mexico, Poland and Roumania. See also **OIL SHALES**; **ANTICLINE**; **FUELS**.

S. F. K.

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**NATURALISM**, a philosophy that borrows its concepts from the physical sciences; the tendency to regard all phenomena as natural, the opposite of supernaturalism. The first definition is naturalism in its more restricted sense, the second, in its broader meaning.

The narrow conception is a speculative extension of physics and chemistry. It was influenced by the earlier developments of these sciences. The philosophy is materialistic and mechanistic in outlook. With the development of the biological and social sciences, naturalism has extended its meaning to include vital and social phenomena as well as those of physical nature. This is the broader meaning. Even religion falls under naturalism in this sense. A naturalistic position need only deny supernaturalism as a legitimate philosophical conception.

**NATURALIZATION**, the legal process by which an **ALIEN** becomes a citizen. The power of naturalization is vested by the Constitution of the United States in Congress and has in general been exercised in three ways. First, the naturalization of whole classes or blocs of population; thus citizenship has been conferred upon whole Indian tribes; second, the naturalization of the peoples of annexed territories; and, third, the naturalization of individuals. The procedure to be followed in the last instance has been carefully outlined by statute. The process divides itself into two parts: first, the declaration of intention, and second, the issuance of the final citizenship papers. The first step can only be taken after one year's residence in the United States, and only if the applicant is 18 years of age, in which event he may go before either a Federal court or a state court of record having equity or law jurisdiction in cases in which the amount is unlimited, and present to the court satisfactory evidence relative to his character and to the method of his admission to the United States. At this time a fee is charged. Not less than two years later, nor more than seven, the act of naturalization may be consummated and final citizenship papers issued; but only on condition that the applicant has resided in the United States at least five years and is at least 21 years of age. The applicant must present a petition for citizenship to the court, signed by two reliable American citizens who must swear that they have known him for at least five years and that he is of good moral character. He must be able to read and write Eng-



lish and to pass an examination in American history and civics. Finally he must declare that he does not believe in polygamy and is not opposed to organized government. After a lapse of 90 days the petition may be granted, the final papers issued. S. C. W.

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**NATURAL LIGHTING**, illumination due to light from the sun and sky. At midday in summer, the illumination out of doors may be 10,000 foot-candles or more, whereas indoors it may be only a few foot-candles. Ordinary glass does not transmit the ultraviolet rays of short wave-length, but special kinds of glass are made which partially transmit these rays. Glass of this type is particularly valuable for solarium of hospitals and sun parlors. Direct sunlight can be diffused by translucent window shades, or redirected by Venetian blinds.

In schools, workshops and offices, windows should be as high and as wide as possible. In classrooms, windows should, if possible, be on the left side only, and room widths should not be more than twice the distance of the top of windows above the floor; the glass area of the windows should not be less than one-fifth of the floor area; to avoid glare, window sills should be at least three feet above the floor and no blackboards should be placed between windows; the windows should begin as near rear wall as possible and should stop on the line with the front row of desks. In workshops, monitor and saw-tooth windows can sometimes be used to advantage; if lighted by windows in opposite walls, the width of the workshop between these walls should not exceed six times the height of the top of the windows above the floor. See also ARTIFICIAL DAYLIGHT; ILLUMINATION, ARTIFICIAL. J. E. I.

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### NATURAL RESOURCES, UNITED STATES.

Among the principal natural resources of the United States may be mentioned the climate since the stimulating coolness of the North Temperate zone has a direct effect on the working habits of the population. Except in a few southwestern states there is plenty of rainfall. This has an enormous effect on agriculture and also contributes to the great resources of water power shared by the eastern, mid-western and western states.

Except in small sections the soil of the eastern coast states is suitable for agricultural pursuits and in the remaining districts it will support forests. In the portion from Canada to the Gulf is an enormous belt of the most fertile flat land while the western coast beyond the Rocky Mountains is a garden paradise.

Only one-sixth of the forests which once covered the largest part of the country remain. Millions of acres lie awaiting reforestation, much of this land being suitable for nothing else. The wasting of the forests is one of the country's saddest national losses, but those

that remain are still one of its principal resources, not only for their timber but for their effect on climate and water flow.

Not more than a fifth of the enormous resources of water power has been developed. The waterflow of New England and the middle Atlantic coast states has been largely harnessed and millions of horsepower are being generated in the western coast states. There are, however, many millions still running free in the south and west. Alaska will in time furnish almost unlimited supplies of waterpower.

In spite of some prophets the mineral resources of the United States have hardly been touched. It is true that its gold output has lessened but many geologists state that there are more untouched veins than have been opened. Silver, copper, lead and zinc are available in tremendous amounts and it is doubtful if the iron deposits will ever be exhausted. Future methods of utilizing low grade ores will make possible the mining of deposits now untouched. The burning of soft coal and lignite at the mine mouth instead of transporting it many miles by rail will also make possible extending soft coal resources. Of the somewhat limited anthracite coal enough remains to furnish all needed for another century. Inexhaustible quarries and clay pits will supply stone of all kinds and brick and cement long after the present civilization has passed.

Decades back, the country was warned that its petroleum would last but a few years more; since then some of the most famous oil districts have been opened. There will be many more such new fields and western oil shale deposits will furnish future generations with all the oil required.

Natural gas reservoirs seem to underlie almost half of the middle west and billions of feet are burned every year, but new eastern wells have been opened where it was thought the possibilities long since exhausted. The United States possess the only wells in the world producing a gas with any large percentage of helium—a fact that may become of the greatest importance as lighter than air craft are perfected.

One of the great natural resources, wild animal life, has been ruthlessly exploited. While the coming of civilization would have resulted in the killing of much larger game, under a wise conservation policy it would have been possible to preserve many—as the bison—as deer are now preserved in most states. In spite of past destruction more game birds and small game animals are shot every year than ever before and present wise game laws promise to preserve this hunting for generations to come.

Apart from their waterpower many rivers of the country are important highways of transportation. Several such as the Hudson, Ohio and Mississippi were the means of rapidly opening up new territory in the past. The coastal harbors are of the greatest value and have made possible the enormous development of overseas commerce. Several are naturally and even without the improvements made later, among the finest in the world.

The Great Lakes have played an enormous part in American development, serving as a commercial highway between some of the most important states and offering cheap transportation for such essentials as wheat, iron, ore and coal.

**NATURAL RIGHT.** At the time of the American and French Revolutions natural rights were political and philosophic issues. They were, indeed, embodied in the constitutions of the new republics of both nations. All men were declared endowed with certain inalienable and inherent rights, such as the right to life, liberty, and the pursuit of happiness. Both constitutions also stated that it was the function of government merely to enable these rights to exist. Later, in the 19th century, natural rights took the form of the right to live, the right to leisure, the right to labor, and were part of radical and revolutionary platforms.

This appeal to natural rights came into the political and economic consciousness of the 18th and 19th centuries through the medium of THOMAS PAINE's *Rights of Man*, J. J. ROUSSEAU's philosophy, and the Physiocrats, among others. They, in turn, went back to the basic philosophical doctrine of a natural order and natural right, which had come down from the Middle Ages. JOHN LOCKE was the chief predecessor of the modern doctrine, with a theory of a natural order in which all men were born free and equal, with the right to exercise this freedom, restricted only by the similar rights of others.

This doctrine served as the basis both of LAISSEZ-FAIRE and of government interference. Some held that government must preserve, define and enforce natural rights, others that the function of government was to leave everyone free to exercise his natural rights. E. W. G.

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**NATURAL SELECTION**, the elimination of the unfit types of animals or plants by nature. The individuals of any one species are not all alike, some having inherited features which make them more or less adapted to the particular conditions under which they happen to be living. Since more individuals are produced than can possibly survive there is great competition in nature not only between species but also within the species. The result is that only the better types survive and pass on their characters to the next generation. This elimination continued over long periods of time leads to a close adaptation between a species and its environment. See DARWINISM. G. K. N.

**NATURE**, the essence of a thing; the sum total of existence; the moving force in things. The first conception is Aristotelian and is embodied in the idea of definition; the second and third, although general philosophical conceptions, are best known by Spinoza's distinction between the *Natura Naturata* and *Natura Naturans*. Nature has also been the point of emphasis of the philosophy which deals with objective existence, or things, in contradistinction to that centering

attention upon the self. It is in this sense that early Greek philosophy was a philosophy of nature.

ARISTOTLE identified the meaning of a thing with its nature; its essence was that into which the thing developed in its complete realization. Rationality was the essence of man; it was his nature. The distinction between nature as existence and nature as a developing process is made according as nature is viewed in its static or its dynamic aspects. The former point of view, the *Natura Naturata*, takes a cross section of existence at any one time and regards its totality as nature. All that is, is nature. The latter conception, or *Natura Naturans*, would penetrate phenomena to their inner workings. Nature is thus regarded as the force at work in things, the principle of development; it is that which makes the wheels of the universe go round, so to speak, and accounts for nature as it is at any given time.

**NATURE STUDY.** Although great teachers of many epochs and countries have urged the superiority of actual contact with nature over artificial, didactic classroom instruction, what is known to-day as nature study is an American educational development dating from the end of the 19th century. The phrase defies exact definition for the very reason that nature study has been kept from becoming a hard and fast branch of education. In general, the idea is to bring the pupil into personal contact with natural forces of his own locality, gradually widening his scope as he progresses in science and allied subjects. The work is partly in laboratory and classroom, partly outside in museums, parks, farms, factories or wherever it may logically lead. But always it is observational and shaped by the resources of the vicinity. Pupils have their own gardens, or study animals, or prepare exhibits of mounted plants, geological specimens, drawing, photographs or casts.

In 1889 W. S. Jackman arranged a nature study course for Pittsburgh schools, later introducing the study as such into the Cook County Normal School. In 1891 his *Nature Studies for Common Schools* was published for teachers. The State Normal School of Oswego, New York, paralleled his early work, while schools in Massachusetts, under the leadership of A. C. Boyden, began to introduce the subject. At first the work in eastern schools depended largely upon individual teachers; but a committee which met in Boston soon prepared and distributed an outline for a model course. The American Nature Study Society was organized in 1908, the New England group having organized in 1903. In New York State, outstanding figures in the movement for more intimate contact of the child with the natural world about him have been LIBERTY H. BAILEY, who wrote *The Nature Study Idea*, 1903, and ANNA B. COMSTOCK, author of *Handbook of Nature Study for Teachers and Parents*, 1911.

**NAUGATUCK**, a town in southwestern Connecticut, New Haven Co., on the Naugatuck River, 15 mi. northwest of New Haven, served by the New Haven Railroad. Naugatuck was incorporated as a

town in 1844. In 1893 it became a borough, and is governed as such at present. The town and borough are co-extensive. Naugatuck is an important industrial center, especially for the manufacture of rubber products. It possesses one of the largest rubber reclaiming plants in the world. In 1929 the total factory output was approximately \$15,400,000; the retail trade amounted to \$4,830,852. Charles Goodyear, inventor of the rubber vulcanizing process, lived here. Other industries include the manufacture of safety pins, chemicals, airplanes and iron products. The Porter Tavern, associated with the name of Washington, is one of the landmarks of Naugatuck. Pop. 1920, 15,051; 1930, 14,315.

**NAUMBURG**, a city in the Prussian province of Saxony, located on the Saale River, about 29 mi. west and south of Leipzig. It was founded in the 10th century by Eckard I, margrave of Meissen and Thuringia, who built a fortress there. A fountain with his statue stands in the cathedral square surrounded by medieval houses. The cathedral is one of the most interesting of older churches in central Germany, being built in the transition style in the 12th and 13th centuries. There are 12 statues of founders of the church, which are among the finest examples of late-Romanesque style. Naumburg has a large trade in wine. Pop. 1928, 29,337.

**NAURU**, an island in the Pacific Ocean, lying 26 mi. south of the Equator and covering an area of about 8 sq. mi. The outstanding features of this island are the phosphate deposits which are exploited by the British Phosphate Commission, and a wireless station built by the Germans, who owned the island till 1919, when it was mandated to Great Britain. Phosphate and copra are the chief products. Pop. 1930, 2,684.

**NAUSEA**, a sensation of distress, with an impulse to vomit, sometimes attended by giddiness and dizziness. It may be induced by certain unpleasant sights, smells, or tastes; by the presence of undigestible food in the stomach, especially when that organ is disordered; by the mechanical stimulation of the pharynx; by disturbance of the semicircular canals of the ear, as in SEA-SICKNESS, dizziness; or after the use of certain drugs, as tobacco, APOMORPHINE or ipecac. Nausea is usually accompanied by increased salivation and involuntary retching movements of the esophagus and pharynx, which may terminate in VOMITING.

**NAUSET**, an extinct North American Indian tribe of the Algonkian linguistic stock. They occupied part of Cape Cod in Massachusetts, east of Bass River, and were closely allied with the Wampanoag. They were early in contact with the whites, remaining their allies through King Philip's War. Previous to this time they were converted to Christianity. The Nauset were apparently agriculturists, for it was from them that the starving Plymouth colonists received corn and beans in 1622.

**NAUSICAA**, in Greek mythology, daughter of Arete and Alcinous, King of the Phaeacians, was noted

for her beauty and modesty. One day while playing ball on the seashore, she found Ulysses (*see* ODYSSEUS) asleep, and took him to her father.

**NAUTICAL ALMANAC**, a compilation of data useful to the astronomer and the navigator, giving for each year the calculated positions of the sun, moon and planets at stated intervals as well as the precise positions of certain stars used for the determination of time. It also contains predictions of eclipses, occultations and other phenomena. The data contained in such an almanac are obtained at a number of observatories by international agreement, and published by the various governments about three years in advance.

**NAUTICAL TERMS.** Port, the left hand side of a vessel when looking forward.

Starboard, the right hand side of a vessel when looking forward.

Weather side, the side towards the wind and consequently getting the full force of the wind.

Lee side, the side towards which the wind is blowing.

Aft, towards the stern. Thus one walks from the stem aft.

Forward, towards the stem or bow. Thus one walks from the stern forward.

Astern, anything behind a vessel. If a tug boat is towing a lighter, the lighter is astern of the tug boat.

Athwartship, across a vessel, that is from side to side.

Heave-to, stopping the engines or adjusting the sails of a vessel when at sea so she remains stationary.

Into the wind, towards the direction the wind is blowing from.

Before the wind, away from the direction of the wind. Opposite to into the wind.

Tack, to change the direction or course of a vessel by shifting or altering her sails.

Beating, sailing against the wind by tacking.

Windward, the direction the wind is blowing from.

Lying to, a term applied to a vessel when she has out a sea anchor.

Fluky, a term applied to a wind constantly changing strength and direction.

Fouled, ropes or chain tangled. The term is often used, when one vessel becomes tangled up with another.

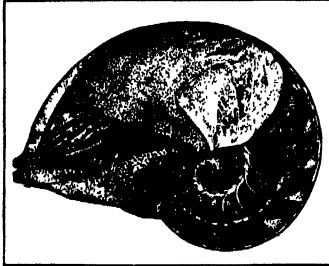
Luff, turning the bow of a sailing vessel into the wind. The term is also used for the forward edge of a sail.

Berth and Belay, see separate articles.

**NAUTILUS** or **CHAMBERED NAUTILUS**, the only remaining genus of a subclass (*Tetrabranchia*) of cephalopod mollusks, whose members were numerous in bygone ages. There are only four species, the best known being the pearly nautilus (*Nautilus pompilius*), found in the South Pacific between the Philippine and Fiji islands, in the former of which it is taken for its beautiful shell.

The nautilus is the most primitive living cephalopod, and the only one whose shell serves as a house. The completed shell is spirally coiled in one plane,

and divided into about 36 chambers by walls or septa secreted by the animal after each period of growth. A tube passes from the animal, which lives in the outermost chamber, through little holes in the septa to the original simple chamber. The shell is formed of two layers. The outer one is porcellane-



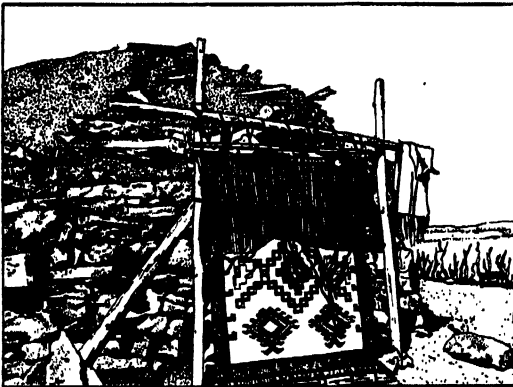
COURTESY AMER. MUS. OF NATL. HISTORY

CHAMBERED NAUTILUS  
(*Nautilus pompilius*)

ous, while the inner is composed of mother-of-pearl.

The nautilus swims backward like a squid. It is generally found in deep water off islands and reefs, but it often comes into shallow water at night. The creature has been caught in water from 18 to 1,800 ft. deep. It is carnivorous, and feeds largely on prawns. In the Fiji and other Melanesian islands the natives catch the nautilus in basket traps, like lobster pots, for food.

**NAVAHO** or **NAVAJO**, an important North American Indian tribe speaking a dialect of the Athapascan linguistic stock. They number about 30,000 and live in northwestern New Mexico and northeastern Arizona in the region drained by the San Juan and Little Colorado rivers north of the Santa Fe

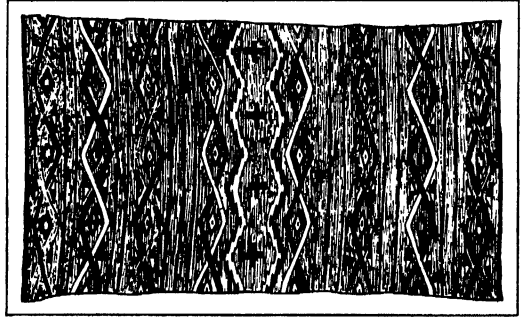


COURTESY AMER. MUS. OF NATL. HISTORY

NAVAJO BLANKET ON LOOM AND PRIMITIVE HOUSE, ARIZONA

Railroad. The first Spaniards described them as an agricultural people, but during the Spanish occupation they became shepherds. Because of their almost constant predatory warfare against white settlers and the Pueblo Indians, Kit Carson invaded their territory in 1863, killed so many of their sheep that they had no means of support and took the majority of the

tribe prisoners. In 1867 they were given herds of sheep and goats and returned to their original territory where they have since remained peaceable and have prospered greatly. Some of their wool is sold



FROM P. E. GODDARD, INDIANS OF THE SOUTHWEST, COURTESY AMER. MUS. OF NATL. HISTORY

NAVAJO BLANKET

but for the greater part is made into blankets which are famous for their beauty of coloring and design. The Navaho are also expert silver-smiths and make beautiful bracelets and other ornaments. They are graceful and skilled horsemen.

**NAVAJO NATIONAL MONUMENT**, established Mar. 20, 1909 and reduced to its present size of about 360 acres Mar. 14, 1912, comprises three small areas in northeastern Arizona. Each separate area contains a remarkable prehistoric ruin. The Betatakin ruin, the only one which has been excavated and restored, is situated in a great cave 400 ft. long with a maximum depth of 150 ft. It contained more than 130 ground-floor rooms. Kitsil, the largest of the three cave pueblos, contained over 250 rooms, completely filling a cave 350 ft. long and 50 ft. deep. The third ruin is Inscription House in Nitsie Canyon. The town of Kayenta, the outfitting point for the saddle and pack horse trip to the monument, is about 163 mi. by automobile from Flagstaff and is about the same distance from Grand Canyon National Park via Tuba City.

**NAVAL ARCHITECTURE**, This term should be more properly marine architecture, for it includes making the necessary calculations and the designing not only of naval or war vessels, but also those of merchant and pleasure. The general procedure for making the calculations and preparing the design is the same whatever the type, and is briefly outlined below.

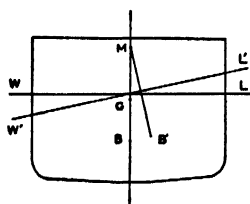
The prospective builder of, say, a cargo steamer gives the naval architect the limiting dimensions and outlines the requirements of the vessel, which is to engage in a certain trade. From these dimensions and requirements that include length, breadth, depth and draft a set of lines giving the shape or form of the vessel is prepared. These lines must be carefully laid out to avoid, for example, a form that is hard to drive, or sections aft that do not give the water a fair run to the PROPELLER.

The lines are laid out on a drawing board often to

a scale of  $\frac{1}{4}$  in. to the foot, depending however, on the size of the vessel. From the lines the **DISPLACEMENT** is calculated to the load water line. Simultaneous with the displacement, the transverse, and fore and aft position of the center of buoyancy (*see* **BUOYANCY, CENTER OF**) are calculated.

The weights of the hull, engines, boilers, cargo, coal and oil, stores, crew, passengers of the finished vessel are estimated, and the total should equal the displacement as calculated from the lines. Next, the moments of these weights both transverse, and fore and aft are calculated, and a transverse center of gravity above the base line and a longitudinal center of gravity from the midship section arrived at.

The stability of the vessel is now considered. A midship section (*see figure*) of the vessel is drawn



to any convenient scale and on it located the transverse centers of buoyancy and gravity designated respectively by B and G. Assume that the vessel has a list and is inclined,  $W'L'$  becoming the new water line and  $B'$  the new position of the center of buoyancy. Now a line drawn from  $B'$  perpendicular to  $W'L'$  will meet the perpendicular through B at M, and this point M is called the transverse metacenter, and the distance  $GM$  the transverse metacentric height. If G is below M the vessel is in stable equilibrium, if above M unstable and if it coincides is in neutral or indifferent. The method just outlined is known as the metacentric method for calculating the stability of a vessel.

It should be noted that if the distance between G and M is too large a very uncomfortable ship (the ship being "stiff" and returning when inclined to a vertical position with a jerk) is obtained. But if the distance is too small, an unsafe vessel results. Hence the location finally selected by the naval architect is a compromise, and for merchant vessels varies from one to three feet.

There are many other calculations as the longitudinal metacenter for trim, the effect of flooding different compartments, raising and lowering of weights, that are made for large vessels, but which are not required for tug boats, lighters and small craft.

It is often necessary to find the distance a vessel will sink when known weights are placed on board, or how much she will rise if weights are removed. For instance, if A is the area of water plane in square feet, then the displacement of a layer one foot thick, assuming the vessel to be parallel sided is,  $A \times 1 = A$

cu. ft., or  $\frac{A}{35}$  tons in salt water. For a layer one inch thick, the displacement =  $\frac{A}{35 \times 12}$  tons, which is the number of tons that must be placed on board to make her sink one inch, or the number to be removed to lighten her one inch.

Having prepared the lines and made the necessary displacement and stability calculations, the working plans, as shell expansion, framing, deck plating and others, are drawn in conformance with the scantlings as required by the classification society (*see* **SHIP, CLASSIFICATION OF**), under which the vessel is to be built. *See also* **SHIPBUILDING; STABILITY. C. H. HU.**

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**NAVAL ASYLUM.** *See* **NAVAL HOME.**

**NAVAL AVIATION.** Since the flight of Orville Wright in 1903, naval aviation has slowly but surely developed into one of the five fingers of the naval service, and has taken its place in the fleet. The World War brought into notice the condition of aviation, and also its possibilities. In 1914, the French, Germans and British all had airplanes, and the British were able to send a small number of squadrons with their first troops to France. Up to this time, planes had been used largely for reconnaissance. Two-seaters were used first for that purpose. Then came the fast single-seater, used as a scout. Soon came the airplane for fighting, and the two-seater was armed. By 1916, they carried machine guns and night fighting was attempted.

Navies were provided with a new means of reconnoitering for an enemy, observing his moves and correcting gunfire on their own ships by wireless. From necessity held to shore bases at the start, it soon became advisable and necessary to get planes to sea with the fleet, especially after it was found that **BOMBS** and **TORPEDOES** could be launched in air. The difficulties of landing in a moderate sea and of keeping under way continuously for any time, were surmounted by devising a vessel on which they could land and take off, fuel and repair. Catapults were invented for use on battle and other sizable ships.

At first, clear flush landing decks were designed; and then, as larger carriers came into play, the island type was constructed. The island has space on one side of the landing deck to carry the control devices of the ship and the necessary personnel. The question of ships and planes heading into the wind was mastered. Great speed was obtained and roomy hangars were designed. The large-size target being vulnerable, destroyer protection came into play.

In 1931 the United States had the largest carriers—33,000 tons. (*See* **AIRCRAFT CARRIERS.**) Smaller ones for the future are indicated. The various units and combinations thereof in naval aviation are: 1. Aircraft Squadron, comprising Aircraft Division, Aircraft Section and Flight; 2. Aircraft Group; 3. Fleet Aircraft Squadrons, formerly Fleet Air Force; 4. Force Aircraft Squadrons. Aviation is now referred to as the eyes of the fleet. *See also* **BATTLE AT SEA; MILITARY AVIATION.**

R. E. C.

**NAVAL BASES,** centers from which all men-of-war can operate and be maintained. They may be of permanent or temporary character, depending upon whether constructed naval accommodations are of a fixed or transient nature. U.S. Naval Bases are di-

vided geographically into two classes, home bases and outlying bases; and these are divided further into main bases, subsidiary bases, and bases for particular types of craft, such as destroyer bases, submarine bases or aviation bases.

Naval operating bases are located at Balboa, Canal Zone; Hampton Roads, Va.; Key West, Fla.; New Orleans, La.; Pearl Harbor, Hawaii; San Diego, Cal.; San Francisco, Cal. Submarine bases are located at Cavite, Philippine Islands; Hampton Roads, Va., and Key West, Fla., and all in 1931 were inoperative. Those at Coco Solo, Canal Zone; New London, Conn., and Pearl Harbor, Hawaii, were operative. There are inoperative submarine-destroyer bases at Astoria, Ore., and Squantum, Mass. Naval Reserve aviation bases are located at Squantum, Mass.; Miami, Fla.; Minneapolis, Minn.; Valley Stream, L.I., N.Y.; Rockaway, L.I., N.Y.; Grosse Isle, Mich.; Great Lakes, Ill.; St. Louis, Mo.; Long Beach, Cal.; Oakland, Cal., and Seattle, Wash.

R. E. C.

**NAVAL CRUISES.** These expeditions are divided into various classes, such as search for an enemy, protection of government interests, exploration and visits to friendly countries. Only in modern times have fleets, as a whole, made long cruises or cruises at great length from home or home bases. The reasons for the latter are evident. In earlier times, squadrons, divisions, or single ships made exploration cruises. Such was the voyage around the world of Lord Anson in 1740-1743; or the voyage of the Antarctic explorer, Rear Admiral Charles Wilkes, 1839-1842.

It is the custom of the leading nations to have practice cruises to foreign ports, singly or in squadrons, for their midshipmen, using special vessels, as a rule, for this purpose. It remained for the United States to take the lead in naval foreign cruises, particularly in the Around-the-World Cruise of the battleships, 1907-1909, and the Australian-New Zealand Cruise, 1925.

The originator of the former cruise was President Theodore Roosevelt. Sixteen of the battleships of the fleet were assembled at Hampton Roads, Va., and these, together with a small tender, sailed on Dec. 18, 1907, for a cruise around the world. The object of this cruise was to test the cruising ability of the fleet, and to establish more friendly relations with the countries visited.

After stopping at leading ports on the east coast of South America, the ships passed through the Straits of Magellan and on up the Pacific Coast, visiting the ports of South American countries located on that side. They entered Magdalena Bay, Lower California, and then headed for San Pedro, San Diego, San Francisco and Puget Sound. They were cordially heralded in the Latin-American countries.

Shifting two battleships for two others on the west coast, the second leg of the great cruise commenced at San Francisco, in July 1908. Rear Admiral Robley D. Evans commanded the armada up to this time, but, having reached the age of retirement, turned

the command over to Rear Admiral Charles S. Sperry, who retained it until the end of the cruise.

The Hawaiian Islands were first visited; then Samoa, where only a portion of the fleet entered the harbor; then Auckland, New Zealand, Sidney, Melbourne, and Albany, Australia, in turn. Their reception in all these places was most friendly.

The fleet continued up the western side of Australia, passing through the Straits of Sunda and the Straits of Macassar to the Philippine Islands and Manila. Here target practice was held before the vessels continued on to Japan. In the Bay of Yokohama, the vessels anchored ship for ship in column alongside the Japanese, and the same friendship was displayed.

Returning on the last leg home, the fleet left Manila Dec. 1, 1908, stopping at Colombo, Ceylon and Port Said, Egypt. It was then divided among the various Mediterranean ports for several weeks, reassembling off Gibraltar in February. The sailing was so timed that the fleet reached Hampton Roads on Washington's birthday, Feb. 22, 1909. There it was met by President Roosevelt who congratulated the men on their safe return, having accomplished an epoch-making voyage, and on having established friendlier relations with various countries visited.

The Australian-New Zealand Cruise of the fleet in 1925 was in the nature of an overseas expedition. The scouting fleet, coming through the Panama Canal from the Atlantic, met the battle fleet, stationed in the Pacific, in a search problem staged some 300 miles southwest of San Diego, Cal., in Mar. 1925. Upon the conclusion of the problem, the two fleets proceeded to San Diego and San Pedro, Cal. On Apr. 3, 1925, they mobilized at sea, and on the 5th entered the harbor of San Francisco in imposing array. Later, the battle fleet attempted a sham capture of the Hawaiian Islands, defended by the army forces, air forces, and certain vessels of the scouting fleet, including submarines. The battle fleet carried many members of Congress and press correspondents to witness the problem. After the completion of the program and the critique at Honolulu, the entire fleet proceeded to Lahaina, Island of Maui, for one month's basing and drills. There were present 145 vessels of all classes, and some 45,000 men.

On July 1, 1925, there sailed south from Honolulu, 56 vessels, including 11 battleships, 1 armored cruiser, 30 destroyers, 5 light cruisers, carrying planes, 9 train vessels, a hospital ship, and supply and fuel ships, carrying some 22,000 men. This armada stopped at Samoa to refuel and to take on fresh provisions, and then continued the voyage to the far southern seas.

Dividing southeast of Australia, eight dreadnaughts of the battle fleet, under the Commander-in-Chief Battle Fleet, visited Sydney, Australia, and then Auckland, New Zealand, while the larger number of vessels, under the Commander-in-Chief United States Fleet, visited Melbourne, Australia, and then Wellington, New Zealand, the destroyers and base force going on to Dunedin and Christchurch.

The officers and men of the fleet were most enthusiastically received by the representatives and people of both countries, who outdid themselves in providing entertainment, including interior railroad trips. Excepting for fresh vegetables and coal for one ship, the vessels were supplied by the train vessels. The ships arrived safely at their home ports on Oct. 3, 1925, after different portions of the fleet had visited Tahiti, the Marquesas, Apia and Pago, Samoa, having lost only eight men of the thousands carried away from the United States.

This cruise was most successful in every way. It added to the friendship of the two nations, effected a subsequent increase in trade and proved the quality and endurance of the ships. The fleet on this cruise was commanded by Admiral R. E. Coontz, Commander-in-Chief of the United States Fleet.

R. E. C.

**NAVAL DISTRICTS.** The United States and its island possessions are divided into naval districts with definite limits and headquarters. In 1931 there were 16 districts in all, ranging from the eastern boundary of Maine to the Philippine Islands, the latter being the 16th district.

The United States islands under naval governors, Guam and Samoa, also Porto Rico and the naval station at Guantanamo, are not included in the naval districts. Each naval district is commanded by a designated COMMANDANT, who in all matters affecting district activity is the direct representative of the Navy Department, including its bureaus and offices. Within each naval district, Marine Corps activities, not attached to a naval unit under the command of a naval officer, are excluded from the jurisdiction of the commandant of the district, excepting their coordination with the general plan of the military defense of the district. Activities on the Severn, Potomac and Kanawha rivers are similarly excluded. In administering affairs in a district, the commandant does not personally supervise details of work or administration of the several units, but transacts necessary business with the officer commanding the group or unit.

R. E. C.

**NAVAL HOME OF THE UNITED STATES,** an important and interesting institution that has been in existence for about 100 years. It comprises some 23 acres and is located in Philadelphia, in the old district of Passyunk. It was once the site of the handsome country seat of the Pemberton family. As soon as a permanent naval force had been established it became necessary to have a place to handle the sick, wounded, or disabled; so in 1799, Congress provided that the 20¢ a month deducted from the pay of all seamen of the Merchant Marine be extended to the Navy, with the same rights to relief as those in the merchant service. The present building was erected in 1833, and finally finished in 1848. Upon entering the home, a beneficiary gives over to the hospital fund any pension of which he is in receipt. In 1882 Naval Home was substituted for Naval Asylum, the name formerly applied to it.

R. E. C.

**NAVAL HOSPITALS.** See HOSPITALS, ARMY AND NAVY.

**NAVAL INSIGNIA.** See INSIGNIA, MILITARY AND NAVAL.

**NAVAL INTELLIGENCE.** The work of the Intelligence Division of the Office of Operations, U.S. Navy Department, is a function that has come into play in the later history of the Navy. It proved its value in the World War as attested by the leading nations engaged in the great conflict.

This division is charged with the collection of information of naval import, both foreign and domestic, for the department and for other naval activities which require it. It publishes and disseminates such information to the naval services and to other interested government departments which require it. It co-operates with the other executive departments of the government in discovering and bringing to justice persons engaged in activities against the United States. It directs all naval attachés abroad and is the official channel of communication for all foreign naval attachés in the United States.

The office keeps in close touch with all naval activities, both in and out of the Navy Department. In war time its functions include charge of the censorship of messages sent by cable and radio. The office of Naval Records and Library collects and classifies, with a view to publication, the records of the naval history of the World War. Its public relations section supplies to the public, on request, information not incompatible with the public interest. Information on the United States Navy is supplied to universities, libraries and schools.

R. E. C.

**NAVAL OPERATIONS, CHIEF OF.** During the temporary absence of the Secretary and the Assistant Secretaries of the Navy the Chief of Naval Operations is next in succession to act as Secretary of the Navy. Under the direction of the Secretary of the Navy, he is charged with the operations of the fleet and with the preparation and readiness of plans for its use in war. This includes the direction of the Naval War College, the Office of Naval Intelligence, the Office of Fleet Training, the operation of the Radio Service and of other systems of communication, the operations of the Aeronautic Service, of Mines and Mining, of the Naval Defense Districts, Naval Militia and of the Coast Guard when operating with the Navy; the direction of all strategic and tactical matters, organizations, maneuvers, target practice, drills, and exercises, and of the training of the fleet for war; and the preparation, revision, and enforcement of all tactics, drill books, signal codes and cipher codes.

R. E. C.

**NAVAL PENSION FUND.** The fund for U.S. Navy pensions was first established by the Act of Mar. 1, 1799, and supplemented by the Act of Apr. 23, 1800, which provided that the proceeds of sales of naval prizes accruing to the United States were to be set aside as a fund for the payment of naval pensions. The act provided that money so accruing should be and forever remain such a fund,

and if insufficient, the public faith was pledged to make up the deficiency.

The Navy Pension Fund has been further augmented by receipts from the following sources: Penalties for cutting timber on lands reserved for the use of the Navy, Act Mar. 2, 1831; money derived from sale of material at the NAVAL HOME which was originally purchased from money appropriated from the income from the Navy Pension Fund; money derived from the rental of Naval Home property, Act June 30, 1914; personal funds and effects of deceased inmates of the Naval Home unclaimed for two years; unclaimed pensions due deceased inmates of the Naval Home, Act June 30, 1914; revenue from transportation of gold shipped on Navy vessels. In the early years payments were made from the principal of the fund and under the operation of the Act of Mar. 3, 1837, authorizing retroactive payments, the fund was entirely exhausted.

In 1868 the fund amounted to \$14,000,000, mostly from the sale of prizes during the Civil War, and by the Act of July 23, 1868, this sum was set aside as a principal fund, to bear interest at 3% per annum thereafter.

The trust fund, Navy Pension Fund, was in 1931 over \$15,000,000, and is being augmented each year by small amounts from the sources specified above. The average annual increment is about \$7,000, coming principally from rental of Naval Home property, proceeds of sale of material at Naval Home, and transporting of gold on Navy vessels. Now that prize money has been abolished, the fund will probably increase slowly. It may be of interest to note that only about 5% of all pension disbursements go to the Navy.

R. E. C.

**NAVAL POLICY**, the system of principles, and the general terms of their application, governing the development, organization, maintenance, training and operation of a navy. It is based on and is designed to support national policies and national interests. It comprehends the questions of number, size, type and distribution of naval vessels and stations, the character and number of the personnel, and the character of peace and war operations.

The fundamental naval policy of the United States is that the navy should be maintained in sufficient strength to support its policies and its commerce and to guard its continental and overseas possessions. In accordance therein, the general naval policy is to create, maintain and operate a navy second to none and in conformity with the ratios for ships established by the treaties limiting naval armament; to make war efficiency the object of all training and to maintain that efficiency during the entire period of peace; to develop and to organize the navy for operations in any part of either ocean; to make strength of the navy for battle of primary importance; to make strength of the navy for exercising ocean-wide control of the sea with particular reference to the protection of American interests, and overseas and coastwise commerce next in importance; to encour-

age, and endeavor to lead in, the development of the art and material of naval warfare; to give every possible encouragement to civil aviation with a view to advancing the art and to providing aviators and aircraft production facilities available for war; to cultivate friendly and sympathetic relations with the whole world by foreign cruises; to support in every possible way American interests, especially the expansion and development of American foreign commerce and an American merchant marine; to maintain a MARINE CORPS of such strength that it will be able adequately to support the navy by furnishing detachments to vessels of the fleet in full commission, guards for shore stations and garrisons for outlying positions; and by the maintenance in readiness of an expeditionary force; and to cooperate fully and loyally with all departments of the government.

The building and maintenance policy is to build and maintain an efficient well-balanced fleet in all classes of fighting ships in accordance with the treaty ratios; and to preserve these ratios by building replacement ships and disposing of old ships in accordance with continuing programs; to make superiority of armament in their class an end in view in the design of all fighting ships; and to provide for great radius of action in all classes of fighting ships. Under this building policy, capital ships, aircraft carriers, cruisers, gunboats, destroyers, submarines, mine layers and mine sweepers, auxiliaries, store and rescue ships are handled.

As other policies there are an organization policy, an operating policy, a personnel policy, a base and shore stations policy, a communications policy, an inspection policy, an information policy and a publicity policy.

On the first day of Dec. 1922, the first real naval policy was approved by the Secretary of the Navy and by the President. This original policy was modified on Oct. 6, 1928, after the failure of the GENEVA CONFERENCE. It was necessary for the navy, through its general policy, to propose a slightly modified policy to carry out the full intent of the so-called LONDON TREATY.

R. E. C.

**NAVAL PROVING GROUND.** The naval proving ground is located at Dahlgren, Va., and comprises over 1,300 acres with a long firing range down the Potomac River. At this place the naval guns are proof-fired before issue, armor and projectiles are tested and general experimental work with ordnance including aviation ordnance, is carried out.

**NAVAL RESERVE.** On July 1, 1925, the Naval Reserve Force established in 1916, was abolished by Act of Congress, and there was created in lieu thereof, as a component part of the U.S. Navy, a Naval Reserve consisting of three classes, the Fleet Naval Reserve, the Merchant Marine Naval Reserve and the Volunteer Naval Reserve. The same act transferred all officers and enrolled men in service who were members of any reserve in existence to one of the three new classes for the unexpired portion of their current enrollment.



Under regulations prescribed by the Secretary of the Navy only male citizens of the United States and of the insular possessions, who are 18 years of age or over, and who obligate themselves to serve in the Navy in time of war or during the existence of a national emergency declared by the President, can be members of the Reserve. No officer or man can be a member of any other military organization. Naval Reserves are allowed to accept employment in any civil branch of the public service and may receive pay and allowances incident thereto in addition to the Naval Reserve pay. *See also* MILITIA.

R. E. C.

**NAVAL SELECTION BOARD.** *See* SELECTION BOARD, U.S. NAVY.

**NAVAL STORES**, originally an industry providing tar and pitch for the construction of wooden ships, but at present includes also turpentine, rosin,

structive distillation of beech and pine wood, was formerly used on the bottoms of wooden ships, but is now used for impregnating and preserving hemp rope. PITCH consists of resinous HYDROCARBONS like asphaltum, TAR, etc., and was formerly used on wooden ships' bottoms, and now to fill deck seams. It was made from wood tar by removing the volatile products.

TURPENTINE and ROSIN are described elsewhere. They are obtained from the exudate of gashed pine trees, by distilling the gum turpentine, which remains in the still. Wood turpentine and wood rosin are important. The United States' standards for naval stores are specified by the Bureau of Chemistry of the Department of Agriculture, and the Bureau of Standards.

E. M. Sy.

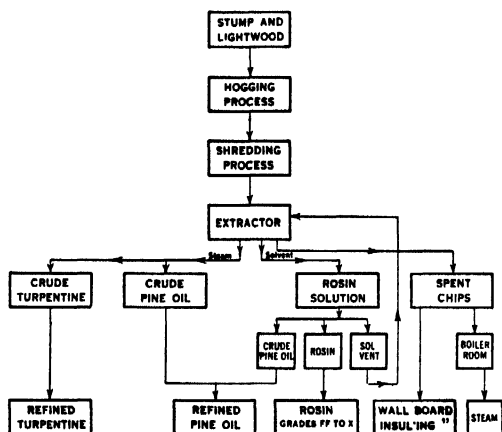
**BIBLIOGRAPHY.**—Thomas Gamble, *Naval Stores Year Book for 1926*, Savannah.

**NAVAL TRAINING STATIONS**, in the United States, are maintained by the Bureau of Navigation at Hampton Roads, Va., Newport, R.I., Great Lakes, Ill. and San Diego, Cal. The course of training of all newly enlisted men covers a period of eight weeks. Special stress during training is placed in training a recruit properly to care for his person and property, infantry drill, pulling an oar, swimming and small arms. If the opportunity comes, additional instruction is given in knotting and splicing. Upon completion of the eight weeks' course, a certain number of recruits selected on a competitive basis, are transferred to service schools for training in special lines. The others are sent to general service and their training continues for eight weeks when they are advanced from the rating of apprentice seaman to seaman, 2nd class, or seaman, 3rd class.

Service schools are maintained to supplement the training carried out on board cruising vessels. Some schools are maintained for petty officers' special training in duties where facilities for training afloat are lacking or inadequate. Other schools simply parallel the training activities afloat.

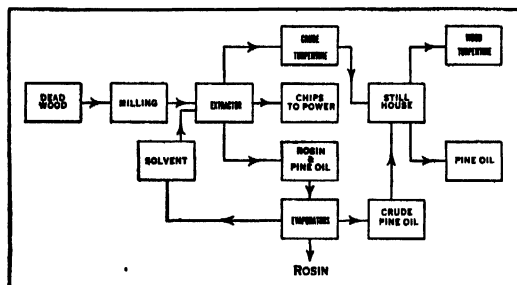
At Lakehurst, N.J., the aerological, aviation and lighter-than-air training is given. At Great Lakes, Ill., aviation, general utility, metalsmith and carpenter's mate aviation and parachute aviation are located. At Navy Yard, New York, N.Y., gyroelectricians are trained. At Portsmouth, Va., is the hospital corps schools. At Mare Island, Cal., is the optical school; at Pensacola, Fla., the photographers' school; at New London, Conn., the sound school, submarine, electrical diesel and training school; while at the four main schools, artificers, buglers, bugle masters, cooks and bakers, electricians, radio operators and officers' stewards and cooks are trained. A special school is located in Washington, D.C., for fire control, hospital pharmacist's mates, and radio material men.

The Naval Academy (*see* U.S. NAVAL ACADEMY) preparatory class is now located at Hampton Roads, Va. A special course of five months in length affords enlisted men an opportunity to prepare themselves for entrance examinations to the Naval Academy. The



FLOW SHEET OF STEAM DISTILLED WOOD NAVAL STORES

tar, pitch, linseed oil, oakum and certain varnishes or gums. Some naval stores have now a much wider application in manufacturing, and some have medic-



FLOW SHEET SHOWING THE MANUFACTURE OF NAVAL STORES PRODUCTS FROM STUMP AND TOP WOOD

nal uses. The industry began on a large scale with the discovery of vast pine forests along the coasts of the southern United States.

Wood tar (*see* WOOD DISTILLATION), made by de-

instruction is given under the supervision of officers of the Navy. The law permits the appointment of 100 enlisted men annually to the Naval Academy from this source, and through these classes the Bureau of Navigation is able practically to fill the quota allowed.

Naval training courses are available to all men of the Navy and are furnished free of charge to any ship or station upon official request. There are two kinds of courses, rating courses, to afford men means by which they may qualify themselves for a particular rating, and general technical courses, to increase the skill of men in naval work. The entire number of training courses offered to enlisted men is 93.

R. E. C.

**NAVARINO, BATTLE OF**, Oct. 20, 1827, an engagement fought at Navarino, a seaport of Greece, between the allied navies of France, England and Russia commanded by Admiral Codrington, against the Egyptian and Turkish navies. The Turkish-Egyptian fleet, violating a verbal agreement not to attack Greece, was sunk despite the fact that no declaration of war upon Turkey had been proclaimed, the countries being officially at peace. The timely intervention by the powers probably saved the cause of Greek independence.

**NAVARE**, a former kingdom in the western Pyrenees, whose territory is now chiefly embraced within the province of Navarra, Spain. Ancient records give the names of various tribes living in this region, chiefly the Vascones; but little can be said about these early inhabitants except that in the south they approximated the peoples of the rest of central Spain, and in the north there lived, and still live, the **BASQUES**. The region was occupied by the Romans under Augustus, raided by the Goths, overrun by the Spanish Moors, and then for a brief period annexed to the Spanish March of Charlemagne's empire. Independence was established during the 9th century, and Navarre expanded slightly to the southward at the expense of the Moorish dominions. During the 11th and early 12th centuries it formed a personal union with Aragon. After their separation in 1134, Navarre no longer bordered upon Moorish territory and all hope of future expansion was ended.

From 1285 until 1328 the kingdom was similarly united in a personal union with France; but in the latter year with the failure of the male line of Philip IV, France passed to the **HOUSE OF VALOIS** while Navarre was inherited by Philip's granddaughter Joanna (*see* **SALIC LAW**). The kingdom remained independent until both the crowns of France and Navarre fell to Henry IV in 1589. But in the meantime the bulk of Navarre, south of the Pyrenees, had been annexed by Aragon in 1512 and so incorporated into modern Spain. The French section was so small that personal union soon amounted to effective annexation and the region became merged with the province of Béarn, though the title of King of Navarre was born by all the subsequent kings of France

except Louis Philippe. The Spanish section retained many of its independent institutions until its support of the Carlist risings, 1834-39, caused the central Government to end all Navarrese privileges.

**NAVASOTA**, a city in Grimes Co., southeastern Texas. It is situated on the Brazos River, 75 mi. northwest of Houston, and is served by bus and truck lines and three railroads. The city is a market and shipping center for cotton, corn and various other crops of the vicinity. The local manufactures include creamery and cottonseed products. Navasota was founded by the Houston and Texas Central Railroad in 1858 and was incorporated in 1866. La Salle, the French explorer, was killed a short distance from the city. Pop. 1920, 5,060; 1930, 5,128.

**NAVE**, in ecclesiastic usage, that part of a church reserved for the laity, as differentiated from the **CHOIR** and the sanctuary which were to be used only by the clergy. In architectural use, nave is used for a central portion of a large hall when the hall is divided by supports, the side areas being known as aisles or side aisles; and for the whole western section of a church up to the crossing.

**NAVIGATING INSTRUMENTS, AERIAL**, instruments used in directing aircraft. The important ones are the **COMPASS**, **DRIFT INDICATOR**, ground-speed meter, clock and **SEXTANT**. Aerial navigation, or aviation, being principally a problem of direction, makes the compass the most important instrument. The compass, however, would be of little use without the drift indicator to measure the angular difference between the heading of the airplane and its course over the ground. In dead reckoning, ground-speed measurements are necessary. These are obtained by means of a sighting device with a scale, whose length corresponds to a definite distance on the ground—when a correction for altitude is made. The travel of an object on the ground is timed along this scale. The aircraft sextant is used for determining geographic position by astronomic measurements. The aircraft timepiece is used for checking ground speed against the map and for astronomical observations. *See also* **AERIAL NAVIGATION**. A. F. HE.

**NAVIGATION** pertains to the directing or conducting from one place to another of air planes and air ships in the air, and vessels in the water. The navigating of a vessel before arriving at a port, is often turned over to a pilot, who is particularly familiar with the tides, channels and local conditions. The pilot sometimes meets the incoming ship several miles out to sea, and directs her movements until she is docked.

In general the same equipment is required for air and water navigation, modified, however, for the field to be used in. Thus there are needed charts or maps showing the ports of departure and designation, and the route to be followed; a **COMPASS** for determining directions; a **SEXTANT** for making observations of the sun and various stars and from these observations calculating the location of the air plane or vessel; and a **CHRONOMETER** for accurately measuring time.

The compass course steered by a ship is affected by variation, deviation, tide and leeway (the effect the sea and wind exert on a ship).

Besides the equipment just mentioned there are other instruments and useful devices. For instance, on vessels gyro-compasses, radio position finders, logs, and echo sounders, while air planes have instruments (*see* NAVIGATING INSTRUMENTS) for indicating their height above the ground, also drift and inclination. When, because of bad weather conditions, it is impossible to make observations, then dead reckoning has to be resorted to.

On land and at sea marking reefs and shoals, and entrances to ports, aids to navigation are required as lighthouses, lightships, beacons and buoys. See articles on these subjects. The lighthouses and lightships are equipped with lights, fog signals and often with wireless instruments for giving the captain of a vessel warnings of danger and also serving to give him his position.

For the safe navigation of the air and sea, different countries have organized departments, and from time to time selected representatives to attend general meetings where international rules and regulations have been prepared. For example, vessels engaging in foreign trade must be equipped with certain lights (*see* SHIP'S LIGHTS), must use international fog signals when in thick weather, and must carry signal flags, with which a vessel of one nationality can readily communicate with one of another. *See also* AERIAL NAVIGATION.

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**NAVY, GENERAL BOARD OF.** *See* GENERAL BOARD OF THE U.S. NAVY.

**NAVY, U.S., ACTIVITIES OF.** The President of the United States is the Commander-in-Chief of the Army and Navy. The Navy Department is one of the executive departments designated by the Act of Apr. 30, 1798, which created the Department of the Navy and designated the Secretary of the Navy as the principal officer of such and made it his duty to execute such orders as he should receive from the President of the United States relative to the procurement of naval stores and materials and the construction of armament, equipment of vessels of war, as well as all other matters connected with the naval establishment of the United States.

Thus the Secretary is, in all matters pertaining to his branch of the public service, the exponent of the President and his acts are to be considered the acts of the President and have full force and effect as such. His official duties are not merely ministerial; they involve the exercise of judgment and discretion. The Secretary is appointed from civil life and by the advice and consent of the Senate. He prescribes regulations not inconsistent with laws for the government of the Navy Department, the conduct of its officers and clerks, the distribution and performance of its business, and the custody, use

and preservation of the records, papers, and property pertaining to it. He must make an annual report to Congress as to the operation and general condition of the Navy during the preceding year. He is a member of the President's Cabinet. He is the supervisor and coordinator of the department as well as the interrelated activities of the Bureaus and offices including the Headquarters of the Marine Corps, all of which Bureaus and offices are constituent parts of the Navy Department. He causes to be prepared the departmental budget based upon the estimated needs of the naval establishment including the fleet, the shore stations and the Navy Department. He has general authority over all expenditures of public funds appropriated by Congress for naval purposes. He authorizes and enters into contracts for service and materials, approves public bills, bonds and bills of sale, and determines questions of salvage, damages, indemnities and the like. He has general charge of and authority over all naval personnel and material, officers and enlisted persons and civilian employees of vessels of surface, subsurface and aerial types, Navy Yards and Naval Stations for the construction, repair, maintenance and outfitting of warships and other craft; the Naval War College for the advanced training of officers, the Naval Academy for the training of midshipmen, and the several stations for the training of enlisted men.

In all legal matters regarding the Navy, he possesses quasi-judicial functions and in the administration of the naval laws governing personnel, he is the final reviewing authority in all cases involving promotions, retirement and disciplinary action except those in which the action of the President is specifically required.

Under the authority of Secretary of the Navy as head of the Department, come the various offices and bureaus of the department consisting of the Office of Operations, the Bureau of Navigation, Ordnance, Engineering, Construction and Repair, Yards and Docks, Supplies and Accounts, Medicine and Surgery, Aeronautics, the Major General Commandant of the Marine Corps and Judge Advocate General of the Navy. These various bureaus and offices have specific functions under the law and these functions are covered by the navy regulations which are approved by the Secretary of the Navy and finally by the President of the United States.

The principal duties of the various Bureaus are as follows:

**Navigation.** The procurement, training, distribution, and administration of the officers and enlisted personnel of the Navy and Naval Reserve; the issue, record, and enforcement of the orders of the Secretary to the individual officers of the Navy; the training and education of line officers and of enlisted men, except of the Hospital Corps; and the upkeep and operation of the Naval Academy, of the technical schools for line officers, of the apprentice seaman establishments, of schools for the technical education of enlisted men, except of Hospital Corps, and of

the Naval Home at Philadelphia, Pa.; the upkeep and payment of the operating expenses of the Naval War College. It is also charged with general supervision of the instruction and training of personnel.

**Yards and Docks.** All that relates to the design and construction of public works, such as dry docks, marine railways, building ways, harbor works, quay walls, piers, wharves, slips, dredging, landings, floating and stationary cranes, power plants, coaling plants; heating, lighting, telephone, water, sewer and railroad systems; roads, walks and grounds; bridges, radio towers and all buildings, for whatever purpose needed, under the Navy and Marine Corps.

**Ordnance.** Cognizance over the upkeep and operation of the following naval ordnance establishments and of their repair, except as otherwise provided in Naval Regulations: Naval gun factory; naval ordnance plants; naval torpedo stations; naval proving ground; naval powder factory; naval ammunition depots; naval magazines on shore; naval mine depots and all that relates to the manufacture of offensive and defensive arms and apparatus, including torpedoes and armor, all ammunition and war explosives. It requisitions or manufactures all machinery, apparatus, equipment, material and supplies required by or for use with the above. It determines the interior dimensions of revolving turrets and their requirements as regards rotation.

**Construction and Repair.** The responsibility for the structural strength and stability of all ships built for the Navy; all that relates to designing, building, fitting and repairing the hulls of ships, turrets, and electric turret-turning machinery, spars, capstans, windlasses, deck winches, boat cranes, steering gear, and hull-ventilating apparatus, except portable fans. It has charge of the docking of ships and is charged with the operating and cleaning of dry docks. It is responsible for the care and preservation of ships not in commission.

**Engineering.** All that relates to the designing, building, fitting out, repairing and maintenance of machinery and its related equipment used for the propulsion of naval ships. It has the same cognizance and responsibility over the following machinery not associated with propulsion equipment: Pumps, except motor-driven pumps for drainage and for distribution of fresh water for ship's use; distilling apparatus; refrigerating apparatus; steam and electric heaters; air compressors, except those required for adjusting and diving on submarines and for charging torpedoes; all steam connections and piping on ships; and all small power-boat machinery.

**Medicine and Surgery.** The upkeep and operation of all hospitals and of the force employed there; it advises with respect to all questions connected with hygiene and sanitation affecting the service, and to this end has opportunity for necessary inspection; it provides for physical examinations; it passes upon the competency, from a professional standpoint, of all men in the Hospital Corps for enlistment, enrollment and promotion by means of examinations

conducted under its supervision, or under forms prescribed by it; it recommends and has information as to the assignment and duties of all enlisted men of the Hospital Corps; it recommends to the Bureau of Navigation the complement of medical officers, dental officers, nurses, and Hospital Corps men for hospitals and hospital ships and has power to appoint and remove all nurses in the Nurse Corps, subject to the approval of the Secretary of the Navy.

**Supplies and Accounts.** All that relates to the purchase, including the preparation and distribution of schedules, proposals, contracts, and bureau orders and advertisements connected therewith, and the Navy's list of acceptable bidders, reception, storage, care, custody, transfer, shipment, issue of and accounting for all supplies and property of the Naval Establishment except medical supplies, but including their purchase, and supplies for the Marine Corps.

**Aeronautics.** All that relates to designing, building, fitting out, and repairing naval and Marine Corps aircraft, their accessories, and equipment except that the bureau recommends to each bureau of the Navy Department the nature and priority of experimental development and production of aeronautic material under that bureau's cognizance. When designs are to be prepared for new types of aircraft, the Bureau of Aeronautics has duties, within its cognizance, similar to those assigned to other bureaus of the Department. The bureau furnishes information covering all aeronautic planning, operations, and administration that may be necessary to the administration of the Navy Department. It also has cognizance over the policy and upkeep and operation of naval aircraft factories; naval aeronautic experimental stations; helium plants, in so far as they come under naval cognizance.

**Judge Advocate General of the Navy.** Cognizance of all matters of law arising in the Navy Department and such other duties as may be assigned him by the Secretary.

**Marine Corps.** Responsible to the Secretary of the Navy for the general efficiency, discipline, and operations of the corps in all branches of its activities.

In conjunction with the Secretary of War, the Secretary of the Navy, through the agency of authorized bureaus and councils, prepares plans for joint operations looking to the safety and defense of the country in time of war or national emergency. The Secretary of the Navy is assisted in his work by an Assistant Secretary and an Assistant Secretary of the Navy for Aeronautics, both being appointed from civil life. In case of the absence of the Secretary of the Navy, one of these two assistants takes his place by authority of law; and in case of their absence, the line of succession is the Chief of Naval Operations, the Chief of the Bureau of Navigation, the Chief of the Bureau of Ordnance and the Chief of the Bureau of Engineering.

The operating force plan calls for the following vessels to be in commission: 16 battleships, first line; 2 cruisers, second line; 15 light cruisers, first

line; 3 light cruisers, second line; 3 aircraft carriers, first line; 2 minelayers, second line; 100 destroyers, first line; 6 light minelayers; 75 submarines, first line; 5 fleet submarines, first line; 2 patrol vessels, eagles; 12 patrol vessels, gunboats; 3 patrol vessels, converted yachts; 6 destroyer tenders; 6 submarine tenders; 2 aircraft tenders, 2 repair ships; 2 store ships; 9 oilers; 1 ammunition ship; 3 cargo ships; 2 transports; 1 hospital ship; 6 ocean tugs; 29 mine sweepers; 4 miscellaneous; 425 planes, including 115 in reserve.

The fleet organization is as follows. The command of the United States Fleet is vested in a Commander-in-Chief whose title is Commander-in-Chief, United States Fleet. His flagship is not normally assigned to any unit of the United States Fleet. The Commander-in-Chief may assign her when necessary to any unit for any purpose he desires. For normal peace-time operations the United States Fleet is divided into four forces. These are the major forces for training and administration and are probably the first war task forces. The four forces are designated as Battle Force, U.S. Fleet; Scouting Force, U.S. Fleet; Submarine Force, U.S. Fleet; Base Force, U.S. Fleet.

The London Treaty limits the United States Navy to capital ships, 462,400 tons; aircraft carriers, 135,000 tons; cruisers with larger than 6-inch guns (18), 180,000 tons; cruisers 6-inch guns, 143,500 tons; destroyers, 150,000 tons; submarines, 52,700 tons. There are certain options allowed as regards cruisers.

R. E. C.

**NAVY, U.S., MEDICAL SERVICE.** Naval medicine was recognized as a special branch of medicine and an indispensable part of the activities of a naval organization even before the existence of the American Navy.

The necessity for this specialty results from the peculiar conditions of naval life, such as recruiting the fit and discharging those who have become unfit for naval duties; ship sanitation and hygiene; medical phases of life in the tropics and in polar regions; war conditions (military surgery); and latterly, medical phases of aviation and of submarine and deep diving activities.

Although the number of personnel of the medical service grew from about 25 surgeons and 35 surgeon's mates at the beginning of the nineteenth century to 135 surgeons and about 200 enlisted assistants in 1842, the real development of the service was retarded until 1842 by the absence of an organized medical department. Since that date it has been under the direction of the Navy Bureau of Medicine and Surgery. Its present wide and complex scope of activities has required its organization into four divisions—Medical Corps, Dental Corps, Nurse Corps and Hospital Corps, consisting respectively of some 900 medical officers, 200 dental officers, 500 nurses and 4,000 hospital corps men.

The mission of the Medical Department is to provide a high type of medical service for the Navy personnel; to reduce the incidence of diseases and in-

juries; to maintain proper sanitary conditions at naval shore establishments and among the forces afloat; to maintain the required standards of physical fitness for entrance upon or retention in the various naval duties; through its supply system and its reserve organization, to be prepared for conditions of war; to provide a sanitary service and medical care for the native populations of certain of our island possessions and for other countries where treaty agreements include this service.

In order to carry out this mission, the Navy maintains well-equipped modern hospitals at Brooklyn; Chelsea, Massachusetts; Philadelphia; Washington; Norfolk; Great Lakes, Illinois; Mare Island and San Diego, California; Newport; Pensacola, Florida; Puget Sound; Parris Island, South Carolina; Canacao, Philippine Islands; Portsmouth, New Hampshire; Annapolis; Honolulu; Guam; Charleston, South Carolina; and the hospital ship *U.S.S. Relief* (a veritable floating hospital which accompanies the fleet); maintains medical department personnel and equipment on all naval stations, naval vessels and with Marine expeditionary forces; supervises native hospitals and rural clinics in Haiti, Guam and Samoa; operates a school of naval medicine at Washington, D.C., and schools for Hospital Corps men at Portsmouth, Virginia, and San Diego, California; maintains Medical Department personnel and equipment for recruiting at offices in 38 cities of the United States; operates supply depots at Brooklyn, San Francisco and Canacao; conducts a continuous program of research in aviation medicine, chemical warfare, and medical aspects of submarine duties and deep diving.

The more romantic chapters of the medical service are to be found in the records of the various wars, in the annals of Arctic and other explorations, in emergency relief work in all parts of the world visited by great disasters, and in the brilliant results obtained through the institution of sanitation and modern service in our island possessions.

Prominent among the names of naval medical officers who rendered distinguished services during the Revolution should be mentioned Joseph Harrison (the first American naval surgeon), Ezra Green and Lawrence Brooks. During the wars with the Barbary States, we remember principally Jonathan Cowdery, Edward Cutbush (known as "the Nestor of the medical corps") and Lewis Heermann. Thirty-four naval medical officers were mentioned in resolutions of Congress for distinguished services rendered during the War of 1812. Of chief distinction among these was Usher Parsons (Battle of Lake Erie). W. P. C. Barton, who became the first Chief of the Bureau of Medicine and Surgery in 1842, served in this war. Outstanding naval medical names in the Mexican war were William Maxwell Wood (Surgeon-General, 1869-71) and Elisha Kent Kane; in the Civil War—Ninian Pinkney (who commanded the first hospital ship, the *Red Rover*) and William Longshaw, Jr.; in the Spanish War—J. B. Gibbs. During the World War the list of medical officers decorated

for heroism while serving with the Marines at the front is far too long for separate mention. Of the twelve Congressional Medals of Honor awarded to the entire Navy during the World War, six were awarded to members of the Medical Department.

Principally associated with explorations are the names of Elisha Kent Kane (the Grinnell Arctic expeditions, 1850-55) and James Markham Ambler (the ill-fated Arctic voyage of the *Jeannette*, 1881).

Four noteworthy instances of relief work in which the Navy Medical Corps was particularly active occurred during recent years.

One of these was occasioned by the explosion on the excursion ship *Mackinac* in Narragansett Bay in 1925, in which the 80 seriously injured persons were quickly removed to and promptly treated at the Newport Naval Hospital. Another was the brilliant performance of Commander Lucius Johnson, Medical Corps, U. S. Navy, in Santo Domingo, following the 1930 hurricane. The others include the relief work in connection with the Nicaragua earthquake and the hurricane in British Honduras in 1931.

One of the most glorious of all chapters of the achievements of the Navy Medical Corps in the tropical islands has been written in Haiti, where, under the terms of the twenty-year treaty, modern sanitation and hospital service transformed a country teeming with filth and disease into a land comparing well in health conditions with any point in the tropics, and three million disease-riddled inhabitants were restored to comparative health. Principally associated with this project are the names of Captain C. S. Butler, Medical Corps, U. S. Navy, and Captain K. C. Melhorn, Medical Corps, N. S. Navy.

The Navy medical service has been ably directed by 21 successive chiefs of the Bureau of Medicine and Surgery since 1842. Since 1871 the Bureau chief has held the title of Surgeon-General, and since 1897, the rank of rear admiral. *See also* EPIDEMIOLOGY; QUARANTINE.

C. E. R.

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**NAVY, U.S., SERVICE SCHOOLS**, schools maintained to give special instruction in various lines of postgraduate work in particular subjects pertaining to the navy, to a certain number of officers who have the requisite qualifications, who show aptitude and who request the instruction. The following courses are in operation. War College, Newport, R. I.: one year. Senior course, for officers of command or flag rank. Junior course, for lieutenant commanders and lieutenants with at least six years' service as commissioned officers. Correspondence course, for any officer ashore or afloat. A few staff officers of the NAVY, MARINE CORPS officers, and ARMY officers take this course every year for a study of problems affecting their service branches. Army War College, Washington, D.C.: one year. A few naval officers and Marine Corps officers who have completed the Naval War

College course, attend this course each year. Special attention is given to problems affecting the joint maneuvers of the Army, Navy and Marine Corps.

Special postgraduate instruction is given in engineering (mechanical, electrical, communication, steam, machinery, radio, internal combustion engines, aeronautics, acoustics); ordnance (design, torpedoes, ballistics, explosives, metallurgy, fire control); civil engineering; naval construction and law; compass installation and navigational instrument design. The first year of all courses is given at the Postgraduate School at Annapolis, Md., and consists of the preparation and technical groundwork. The preliminary course merges into the specialization course and is continued at the several institutions which offer the best facilities in the given work; special instruction is now given at Columbia, Harvard, Yale, Massachusetts Institute of Technology, Chicago, Rensselaer and George Washington. Officers taking the law course do so at George Washington University and are assigned to duty in the office of the Judge Advocate General of the Navy during their three years' course. Officers are selected for postgraduate work in engineering and ordnance five or six years after graduation; and in naval construction and civil engineering, one or two years after graduation. Officers successfully completing the latter courses are transferred to the Naval Construction Corps and Civil Engineering Corps respectively.

The general line course, postgraduate school, is located at the Naval Academy, Annapolis, Md. The submarine course is given at New London, Conn. The torpedo course is given at Newport, R.I.; aviation course, at Pensacola, Fla.; optical instruction at the Navy Yards, Washington, D.C., and Mare Island, Cal. The gyro course is given at Navy Yards, New York, N.Y., and Mare Island, Cal. Correspondence courses are issued to officers requesting them in international law, strategy and tactics, duties of supply officers and pay clerks, and navigation. *See also* WAR COLLEGE, ARMY; WAR COLLEGE, NAVY; ARMY SCHOOLS.

R. E. C.

**NAVY DEPARTMENT**, a government department with general powers in constructing, arming and manning the war fleet of the United States and directing its movements. One assistant-secretary is charged with the supervision of naval aeronautics. The Office of Naval Operations, under a chief of naval operations, directs the operations of the fleet and maintains naval preparedness for war. Under the control of this office are the Naval War College, the Office of Naval Intelligence, the Office of Fleet Training, the Radio Service, Mines and Mining, Naval Militia, and of the Coast Guard when operating with the navy. Subordinate bureaus of the Navy Department include the Bureau of Navigation for the recruiting and training of navy personnel and reserve, maintenance of the Naval Observatory, and the Hydrographic Office which makes charts and surveys of foreign waters and the high seas. Other divisions of the Department are the Bureau of Yards and Docks, the Bureau of Ordnance for the manufacture of arms and appa-

ratus, the Bureau of Construction and Repair, the Bureau of Engineering and the Bureau of Medicine and Surgery. The Judge Advocate General of the Navy takes charge of legal business in the department. The Secretary of the Navy also exercises final control over the Marine Corps. J. C. W.

**BIBLIOGRAPHY.**—*Report of the Department of the Navy, 1931; Congressional Directory, 1931.*

**NAWANAGAR** or **JAMNAGAR**, a town and native state in the Western India agency, Bombay, India. The town, built almost completely of stone, is known for its silks and gold embroidery. Dyeing and the manufacture of locomotives are also important industries. The State of Nawanager, ruled by a chief or *Jam*, produces cotton, grain, copper, marble and has a pearl fishery. The state railway runs from Rajkot to Tamnagar. Area 3,791 sq. mi. Pop. town, 1921, 42,495; state, 1921, 345,353.

**NAWITI**, the name of one of the towns of the Kwakiutl Indians, speaking a language of the Wakashan linguistic stock, formerly situated at Cape Commerell, Vancouver Island, Canada. It is also a synonymy for the Newettee sub-dialect of Kwakiutl.

**NAXOS**, the largest island of the Cyclades in the Aegean Sea, halfway between Greece and Asia Minor. It was famous for its marble quarries and wine called Bacchus. It flourished in the 6th century B.C. especially under its tyrant Lygdamis. The Persians destroyed it in 490 B.C. Joining the Delian League, it revolted in 469 B.C. It became a dependency of Athens.

Naxos also is the name of a Greek city on the east coast of Sicily. It was founded in 735 B.C. by Chalcidians of Euboea, but in 403 B.C. was destroyed by Dionysius of Syracuse. Fifty years later its inhabitants founded a new city on Mt. Taurus called Tauro-menium.

**NAYARIT**, formerly the Territory of Tepic, a state on the west coast of Mexico, and one of the least known and least developed of the Mexican states. It has an area of about 11,000 sq. mi., including the archipelago of Tres Marias. It is traversed by the Sierra Madre Mountains, rising to high cliffs, which overlook deep valleys and plunging mountain streams. The Rio de Santiago is the longest river in Mexico. One active volcano lies within the state. There is an abundance of rain, which, with the rich soil and an entire absence of cold weather, make Nayarit one of the most productive states in the republic. The capital is Tepic and its port San Blas. Pop. 1921, 162,499; 1930, 170,054.

**NAZARETH**, the town in Galilee in which the boyhood of Jesus is reputed to have been spent. *Nazarenes*, the Oriental term for Christians, is derived from its name. Nazareth is to-day a thriving little town with approximately twice as many Christians as Moslems. Pop. 1931, 17,069.

**NAZARETH**, a borough in Northampton Co., eastern Pennsylvania, situated 7 mi. northwest of Easton. It is served by two railroads. The borough has large cement works and factories producing

hosiery, silk, childrens' waists and guitars. Nazareth was originally settled by Moravian missionaries in 1740 and was incorporated in 1858. The home of George Whitfield, an early settler, is now the Museum of the Moravian Historical Society. Pop. 1920, 4,288; 1930, 5,505.

**NAZI**, the popular name for the National Socialist Party in Germany, founded in 1920 by ADOLPH HITLER. In its general plan of organization it closely resembles FASCISM. *See also* GERMANY, HISTORY OF.

**NAZIRITE**, a term derived from the Hebrew *nazar*, to consecrate, applied by the ancient Hebrews to those who in a peculiar sense became devotees of Yahveh. The regulations for the observance of the Nazirite vow are found in Numbers 6. Unshorn locks, abstinence from wine and avoidance of all ceremonial defilement characterize the conduct of the Nazirite, which tends to the return to the simpler and rougher fashions of primitive days. In time Naziritishness lost its significance of old and became a sort of private asceticism. *See also* RECHABITES.

**BIBLIOGRAPHY.**—S. R. Driver, "*Joel and Amos*" in the *Cambridge Bible for Schools and Colleges*, 1897; G. B. Gray, *International Critical Commentary on Numbers*.

**NEAR EAST**, that part of Asia bordering on the Mediterranean Sea and lying to the nearer northeast of this region, in which the principal countries are Turkey and Persia. This area frequently is called Asia Minor.

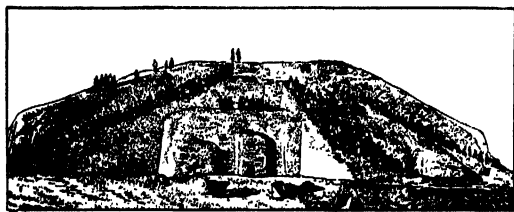
**NEAR-EASTERN ARCHITECTURE** (Ancient). Under this heading is properly grouped a long series of styles occasionally in contact with more western art, but consistently Oriental in their handling. The remains which are known to us were in large measure connected with court life, but even here there are many gaps and chronological uncertainties, so that a well-rounded history of this architecture is impossible.

**Mesopotamia.** The region adjoining the great rivers Tigris and Euphrates was the backbone of the Near East. Its first brilliant civilization developed in city states as early as the 5th millennium B.C. on the alluvial delta at the head of the Persian Gulf. Primitive huts, sometimes rectangular and flat-roofed, sometimes domed or ark-like, were constructed in timber, wattle and dab, and had an evident rôle in forming the tradition when, with city building and the use of brick construction, a more sophisticated architecture developed. The oldest buildings yet found, at Ur of the Chaldees, about 3500 B.C., show that the permanent character of Near-Eastern architecture was settled by types adopted at a time even more remote. A lack of sturdy timber made vaulting an essential part of the tradition, and the relative lack of stone enforced the use of brick. Much of this brick at all times was sun-dried, and laid up in common mud, but from 3000 B.C. at least, fired bricks were known and more and more constantly used. Bitumen from the present oil-well region served as mortar for both types of brickwork. For many centuries stone, cut into thin slabs and applied at the bases of the walls, and fired brick,

often modeled and glazed, in revetments, were most important for their usefulness in protecting massive cores of sun-dried brick from the weather. Hence quite naturally came the character of the typical Mesopotamian building, heavy and blocky, even though its silhouette was usually softened by crenellations, and though its walls, often decorated by a frieze at the base, were relieved by flat recessed panels and pilaster strips. The Mesopotamians never carved in the round with any assurance. Since conventional low relief decoration fitted admirably into their architectural scheme, it became one of the most characteristic elements, and always had an unmistakable Oriental character. This architectural style was classic by the time of the first period of power of the city of Babylon, about 2100 B.C.

**Dwellings.** In the Mesopotamian tradition dwellings are arranged about one or more courts, according to their importance, and are made up of long, narrow rooms entered in the middle of one of the long sides. They had flat roofs, probably of beaten clay. The weight of the terrace roofs determined the narrow span of the apartments where timber ceilings were used. The shape of the rooms suggests that they may, at times, have been barrel vaulted; doubtless the dome form, known from early times, was also used appropriately. It was the custom from early times to construct houses on raised platforms containing drains; thus it was quite natural to dignify and protect royal palaces by constructing large terraces which served as pedestals for them. These terraces were drained by sewers with the vaulting bricks ingeniously arranged so that no form work was necessary in placing them. The interior decorations of the houses and palaces were relatively simple. Stucco painted in earthen colors, stone reliefs and hangings, gave character to the rooms, which were often lighted only through the doorways.

**Temples.** Always relatively simple in scheme, temples consisted of a sanctuary chamber, sometimes raised on a mound. In this case it was reached by a monumental flight of steps, as seen in temples at Ur, of about 3000 B.C. The sanctuary itself and its auxiliary chambers were arranged about an oblong court. In later work staged towers are used to dignify the



COURTESY MUS. OF THE UNIV. OF PENNSYLVANIA

ZIGGURAT OR TEMPLE OF THE NEAR EAST

temple complex; sometimes a sanctuary is lodged on the top, as seen in temples at Ur of about 2350 B.C., or on the side of the tower. Sometimes an angular ramp led to the top of the construction. These *ziggurats*,

said to represent architecturalized hills for the benefit of mountain gods, are characteristic.

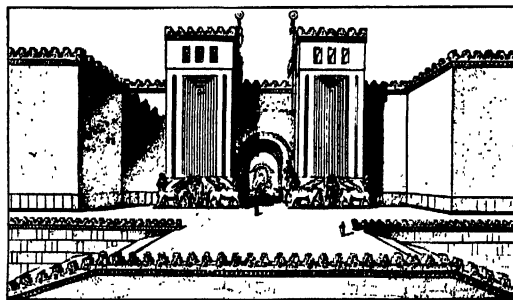
**Vaulted Tombs.** Occasionally vaulted tombs are found. One of the most remarkable, at Ur of about 3500 B.C., has a barrel vault terminated by a sort of semidome on squinches over a rectangular plan. But the Mesopotamians often buried their dead under the floors of their dwellings, and there is no monumental tomb architecture in their tradition.

**Assyrians and Medes.** The Assyrians, a vigorous northern tribe who dominated Mesopotamia by a ruthless military terrorism from about 1275 to 625



VILLAGE WITH DOMES, NINEVEH

B.C., gave impulse to military architecture and perhaps introduced certain motives from their western neighbors, the Hittites, but built strictly in the traditional style. Their building enterprises were on a vast scale because of the large resources of the Assyrians. Their great king Sargon II built in his own honor the fortified city Dur Sharrukin (Khorsabad) which, with its raised palace and *ziggurat*, is one of the best known

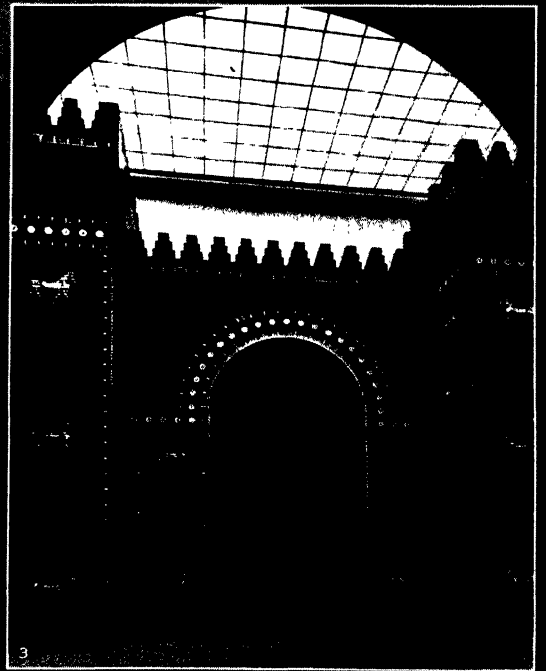
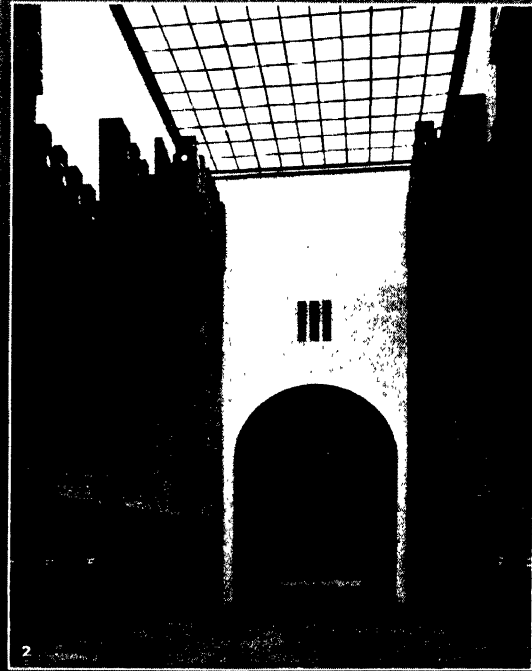
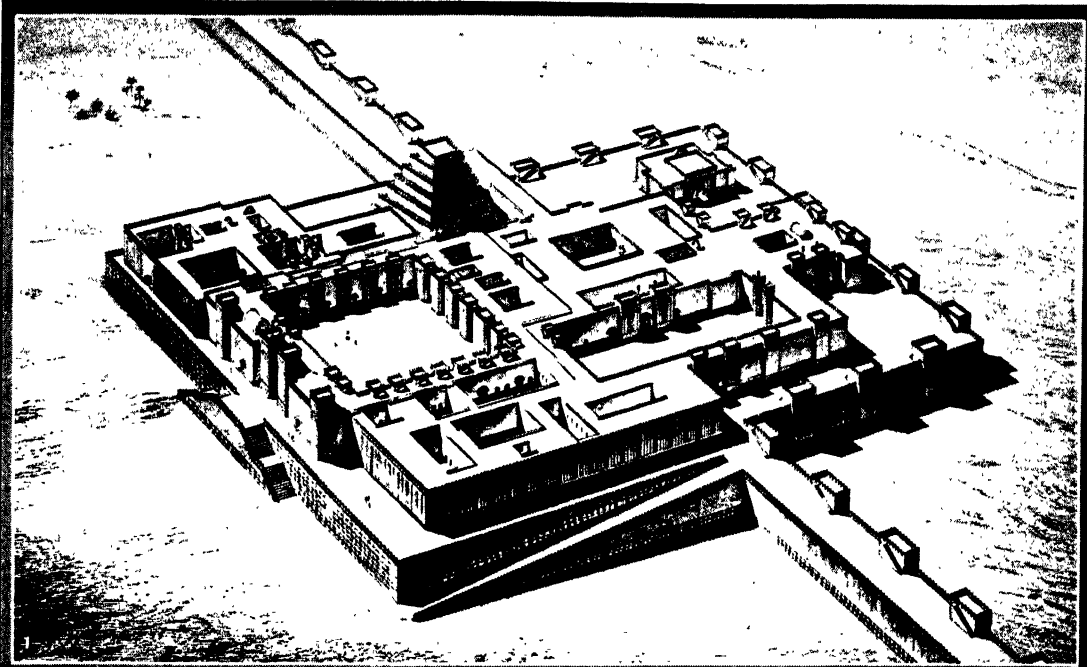


GATEWAY OF SARGON'S PALACE AT KHORSABAD

examples of Mesopotamian architecture. Under the renewed rule of Babylon 625-538 B.C., increased prosperity made possible numerous colossal enterprises, of which the prodigious Temple of Bel-Marduk, or Tower of Babel, was only one, but the style remained unchanged. Contemporaneously the Medes, originally inhabitants of the wood building Iranian plateau, came to power at the expense of the Assyrians. This thrust an Iranian type, the square pillared hall, into



## NEAR-EASTERN ARCHITECTURE



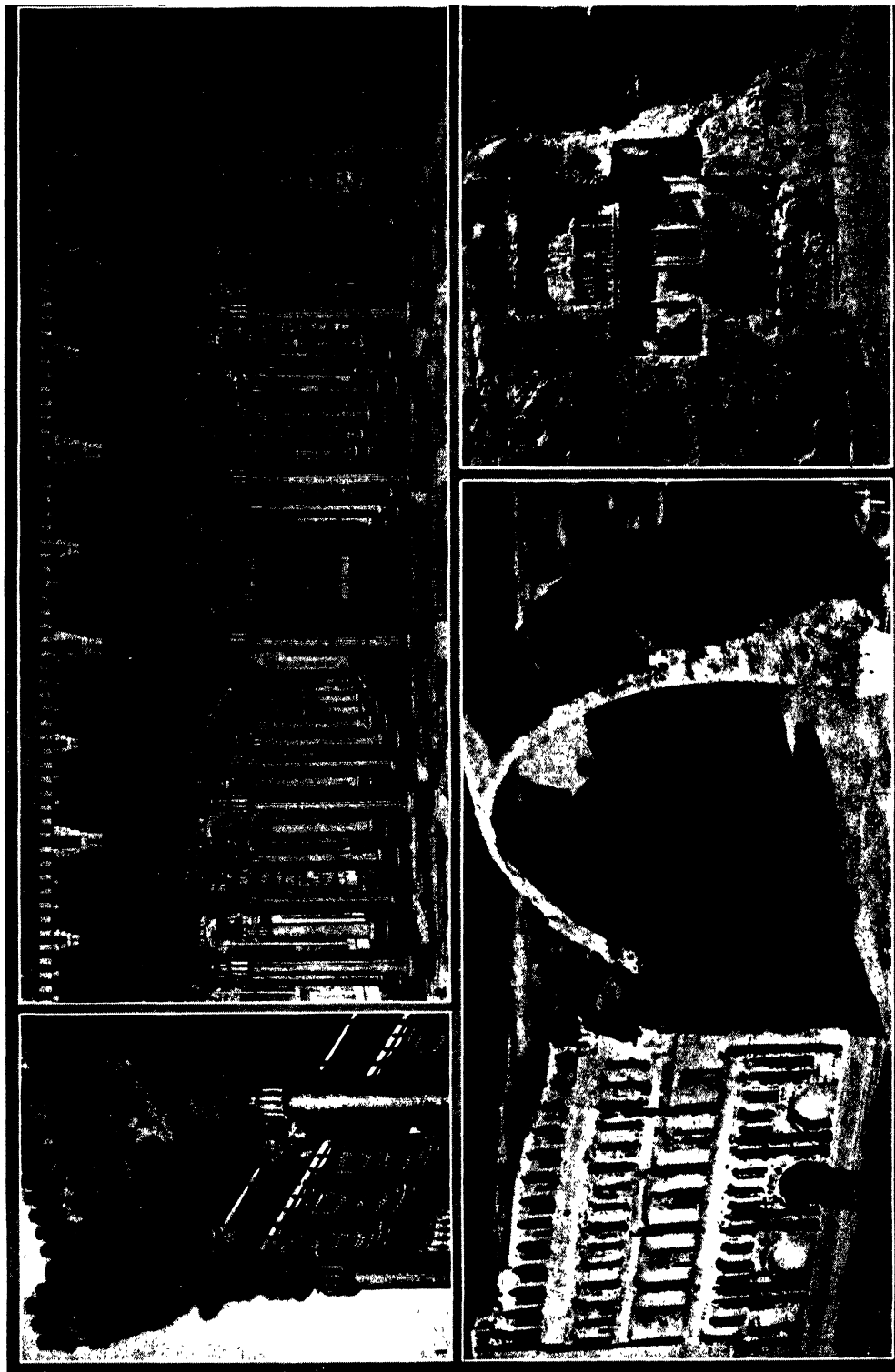
1. DRAWING BY CHARLES CHIPIEZ. FROM GEORGES PERROT AND CHARLES CHIPIEZ. A HISTORY OF ART IN CHALDEA AND ASSYRIA;  
2, 3. COURTESY GERMAN TOURIST INFORMATION OFFICE

### ARCHITECTURE OF ANCIENT ASSYRIA AND BABYLONIA

1. Bird's-eye view of a restoration of the Palace of Sargon, 721 B.C., at Khorsabad, Asiatic Turkey. 2. Reconstruction of the Marduk Procession Street between the fortress walls of Babylon, leading to the Ishtar Gate.

3. The Ishtar Gate, 50 ft. high, and the strongest among those of Babylon. The gate and the wall, both of which have been reconstructed in the Pergamum Museum, Berlin, were ornamented with reliefs of animals in enameled brick.

# NEAR-EASTERN ARCHITECTURE



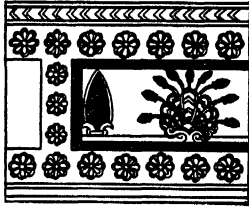
1, 2. FROM GEORGES PERROT AND CHARLES CHIFFEZ, A HISTORY OF ART IN PERSIA; 3, 4. ORIENT AND OCCIDENT PHOTOS

## ARCHITECTURE OF THE ANCIENT PERSIA

Restored detail of the entablature of the Hall of Xerxes, Persopolis.  
 Arched entrance to a vaulted hall in the residence of Chosroës II at Ctesiphon.  
 Hall of a vaulted hall in the residence of Chosroës II at Ctesiphon.  
 Colonnade of a vaulted hall in the residence of Chosroës II at Ctesiphon.  
 Persian architecture.  
 Persian architecture.

the old tradition. The rapid conquests of the Medes and their successors, the Persians, brought them into contact with other peoples and renewed the architecture of the Near East without modifying its eternally Oriental character.

**Persia, Achaemenian Period (538-331 B.C.).** The outstanding monuments of the dynasty which conquered the Babylonians and Egyptians, but was halted by the Greeks at Salamis and Plataea, are to be found at their capital, Persepolis (Takte-Djemshid and Naksh-e Rostem). There are two propylaeas, two large *apadanas*, or audience chambers, and three characteristic palaces. If the superficial vesture of



A. D. F. HAMLIN. A HISTORY OF

ASSYRIAN ORNAMENT

these buildings is Mesopotamian with occasional reminiscences of foreign work, the fundamental element is the flat roofed, Medean, square pillared hall. The Persians used columns of stone; but their slender proportion and elaborate decoration recall wooden originals. Doors and windows were framed in stone with motives recalling Egyptian design. Terraces and ramps with their sculpture were also in stone; but the walls were of brick, and the wide ceiling spans were in wood. The palaces and *apadanas* had porticoes set between solid terminal elements, suggesting the elevation of the old Hittite monumental façades.

GREAT HALL OF XERXES  
AT PERSEPOLIS.



SCALE OF FEET.

SIMPSON. A HISTORY OF  
ARCHITECTURAL DEVELOPMENT.  
LONGMANS, GREEN & CO.

occupied by a carving of the king on his royal divan, the horizontal middle bar by a palace portico carved in relief, with a door leading to the tomb chamber. The Achaemenians are said to have disapproved of temple building. Rare examples of fire altars and temples, the latter, with the forecourt, based on the square pillared hall, may be ascribed to them.

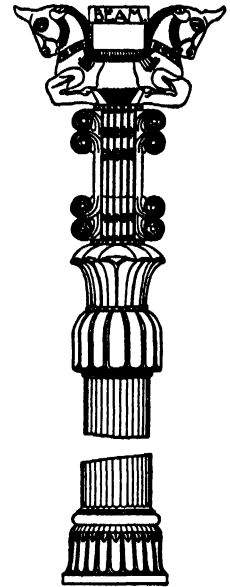
**Sassanian Period (226-640 A.D.).** The art of the Achaemenians was a court art. As much may be said of the superficial Hellenism introduced in Alexander's time and continued by the Seleucidae and the Parthians. The genuine architecture of the Near-East region was moving toward a monumental expression in permanent materials of Mesopotamian vaulting.

This was achieved in the Persian Renaissance under the Sassanian Dynasty. Our knowledge of examples is as yet insufficient for a full history of the style; but its character may be judged from the ruins at Firuz-Abad and Sarvistan, about 308-450, palaces with courtyards and state apartments combined in a simple and orderly manner with a due emphasis on climax and axial arrangements. The walls are in stone; but the vaults, now mostly fallen in, were in fired brick and design so that they could be built without form work. The central audience chambers are in plan a square enlarged by recesses on the four sides and brought to an octagon at a higher level by straddling a single arched elements called squinches; then by shallow pendentives to a circle upon which an egg-shaped dome is set. Elsewhere long halls flanked by lines of niches supported barrel vaulting. The ruins give little hint of Sassanian decoration, which was, in general, remarkable for the beauty of its precious metal and polychrome effects, and greatly admired in antiquity.

The tremendous group called Taq-i-Kisra at Ctesiphon near Baghdad is often ascribed to Sapor I (242-272 A.D.) but may, after all, be the work of the great Chosroës (6th century), for whom it is named. Of the group only a part of the audience hall remains standing. A vast frontispiece rose sheer, concealing minor lateral apartments. It opened in the center to show the full volume of a barrel vault 157 ft. deep, 85 ft. wide and 108 ft. high, constructed in fired brick without form work and one of the most impressive vaults ever built. While it is true that Roman vaulting, which produced marvels in the 1st and 2nd centuries, may be responsible for the Sassanians' choice of the vaulted form, it is nevertheless appropriate that such a triumphant expression of the vault should appear in the land of its origin before Mesopotamia was drawn into the general current of Mohammedan art. K. C.

**BIBLIOGRAPHY.**—G. Perrot and C. Chipiez, *A History of Art in Chaldaea and Assyria*, trans. W. A. Armstrong, 1884, and *A History of Art in Persia*, 1892; P. S. P. Handcock, *Mesopotamian Archaeology*, 1912; E. Bell, *Early Architecture in Western Asia*, 1926.

PERSIAN COLUMN  
CAPITAL AND BASE.



PLAN.

SCALE OF FEET.

FROM F. M. SIMPSON. A HISTORY OF  
ARCHITECTURAL DEVELOPMENT.  
LONGMANS, GREEN & CO.

**NEARSIGHTEDNESS.** See AMETROPIA.

**NEBRASKA**, one of the North Central States of the United States, popularly called the "Tree Planters' State." It is situated between 40° and 43° N. lat. and about 95° and 104° W. long. On the north it is bounded by South Dakota, on the east by Iowa and



NEBRASKA STATE SEAL

Missouri, on the south by Kansas and Colorado, and on the west by Wyoming and Colorado. Nebraska comprises an area of 77,520 sq. mi. inclusive of 712 sq. mi. of water surface. In size Nebraska is 15th among the states of the Union.

**Surface Features.** The surface of Nebraska represents an almost smooth

plain, sloping from west to east, with a mean altitude of 2,600 ft. above sea level. The Wyoming-Nebraska boundary in Banner Co., 5,300 ft., is the highest point; the lowest, 852 ft., is the level of the Missouri River in Richardson Co.

The great part of Nebraska belongs conventionally to the semi-arid Great Plains which border the Rocky Mountain system on the east. The western part of the state, north of the Platte River, is known as the sand hill region because of the dominating formation of sand dunes, some several hundred feet high. Between the lines of sand hills, now largely clothed with grass, are numerous small lakes and ponds.

East of the sand hill district, on both sides of the Platte River, is an area of great flatness known as the loess-covered plains. Their dust-like loam mantle continues into eastern Nebraska, which belongs to the humid Central Lowlands of the United States, and completely obscures the line of contact between the two provinces.

The Niobrara and Platte rivers, both tributaries of the Missouri, cut curving, shallow valleys across the state. Within 100 mi. of the western border, the valley of the North Platte begins to widen and spreads to 50 mi. wide on the Wyoming line. This depression is a part of the Goshen Hole which is a picturesque lowland, dissected by mesas, buttes and bad-land topography.

**Climate.** Because of its midcontinental position and high average elevation, the climate of Nebraska, though dry and exhilarating, varies greatly in different parts of the state, especially with regard to rainfall. With respect to precipitation, eastern Nebraska is similar to the other central Mississippi valley states, but the higher plains in the western half are arid. The mean annual temperature is 48.8° F. At Omaha the extremes between winter and summer range from an average of 21.9° F. for January to 76.7° F. for July. During the period 1876-1930 the highest temperature recorded in Nebraska was 115° F. and the lowest, -47° F. The average annual precipitation is 23.5 in., varying to only 12 in. near the western border. At

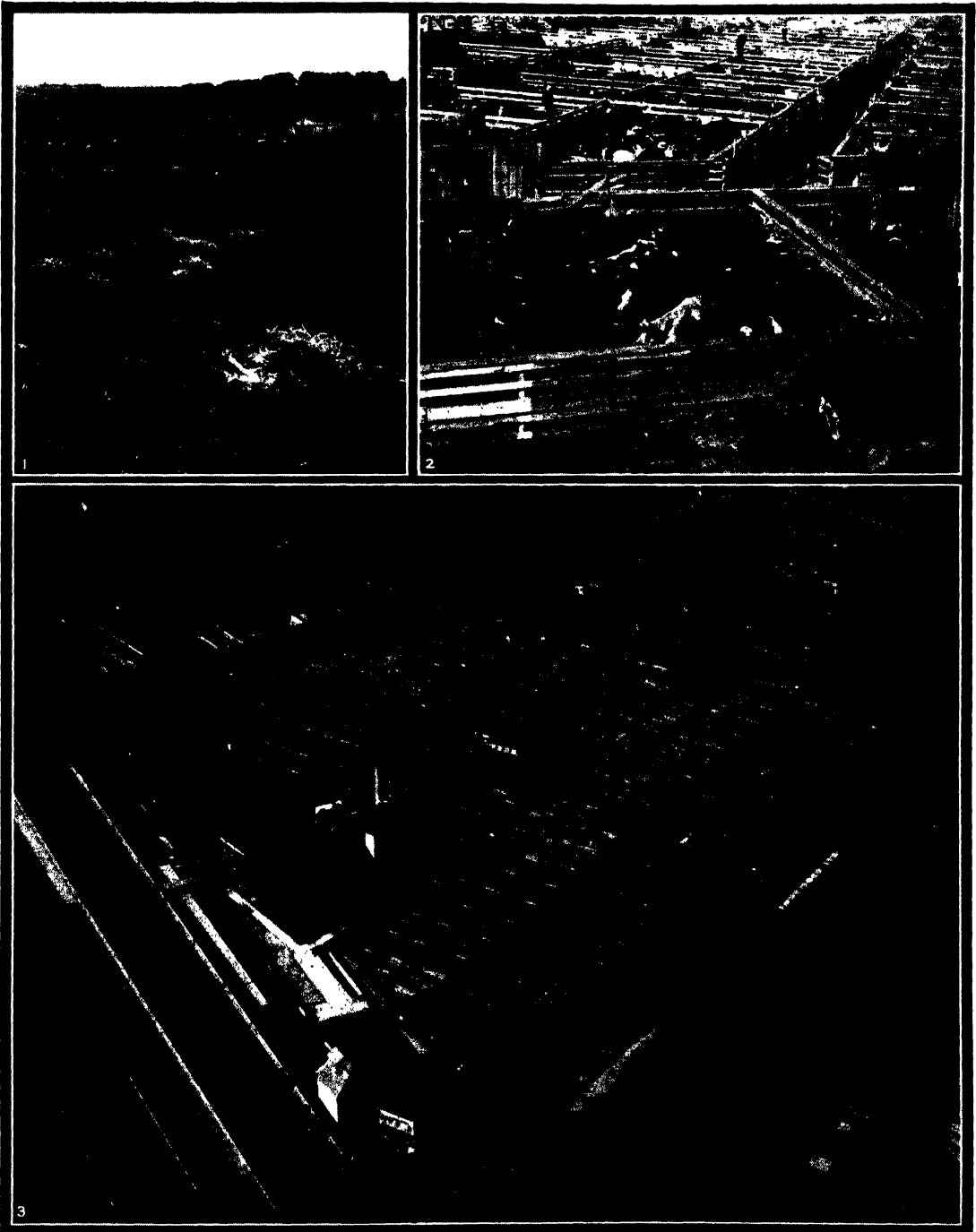
Omaha the average growing season is 181 days; at North Platte, 152 days.

**Forests and Parks.** A small percentage, approximately 1,000,000 acres out of a total land area of 49,157,120 acres, is forested. Evergreen forests cover the Wild Cat and Pine Ridge hills in the western and northwestern sections. The Niobrara River runs through hills and cañyons beautifully wooded with cedar and spruce close to the northern boundary. The Nebraska National Forest in two divisions, the Niobrara and Bessey, covers a total net area of 206,026 acres and forms a favorite camping ground for cross-country motor tourists. Arbor Day originated in Nebraska and the forestry enthusiasm of early settlers gave it the name of the Tree Planters' State. A system of state parks was started in 1921 with the creation of CHADRON PARK in the Pine Ridge region. Eight state parks with a total area of over 1,000 acres have facilities for camping, picnicking, boating and swimming. Fishing and hunting are permitted in 4 parks which were originally administered by the Bureau of Fish and Game. Both divisions of the National Forest are game preserves in addition to 18 reservations of approximately 350,000 acres which have been established in various sections of the state. SCOTTS BLUFF National Monument, an important land mark of pioneer days, is located on the North Platte River in western Nebraska.

**Minerals and Mining.** The mineral resources of Nebraska are of slight importance, metals, coal and petroleum being absent. There are, however, deposits of pumice, in the production of which the state is surpassed only by Kansas. With mineral productions in 1929 amounting to \$4,844,542, Nebraska stood forty-second among the states. The chief product was sand and gravel, 3,370,513 tons, valued at \$1,857,065; other products were cement, clay products, stone and pumice. In 1929 48 mines and quarries gave employment to 351 persons who received \$677,500 in salaries and wages.

**Soil.** Notwithstanding their extraordinary variety, the soils of Nebraska on the whole are unusually well adapted to agriculture. The eastern one-fifth of the state is made up of drift, largely overlaid with loess, resulting in soils of exceptional fertility. In the southeastern part of this area, as at Lincoln, small saline deposits occur. Extent and quality both considered the best soils are those in the region overlaid by the loess. This deposit extends in a broad belt from the northeastern border diagonally across the state to the Colorado boundary, with an average thickness of about 100 ft. On river bluffs, as at Omaha, loess prevails at great depths, sometimes exceeding 200 ft. It consists of a fine sandy loam containing considerable humic material. Over both drift soil and the loess there is a surface layer of rich black vegetable mould, unexcelled for the raising of field crops. The valleys of the larger streams possess equally fertile deposits of alluvium. In the western half of Nebraska are the sand hills, occupying a total area of some 20,000 sq. mi. This extensive region is not barren, as the soil

## NEBRASKA

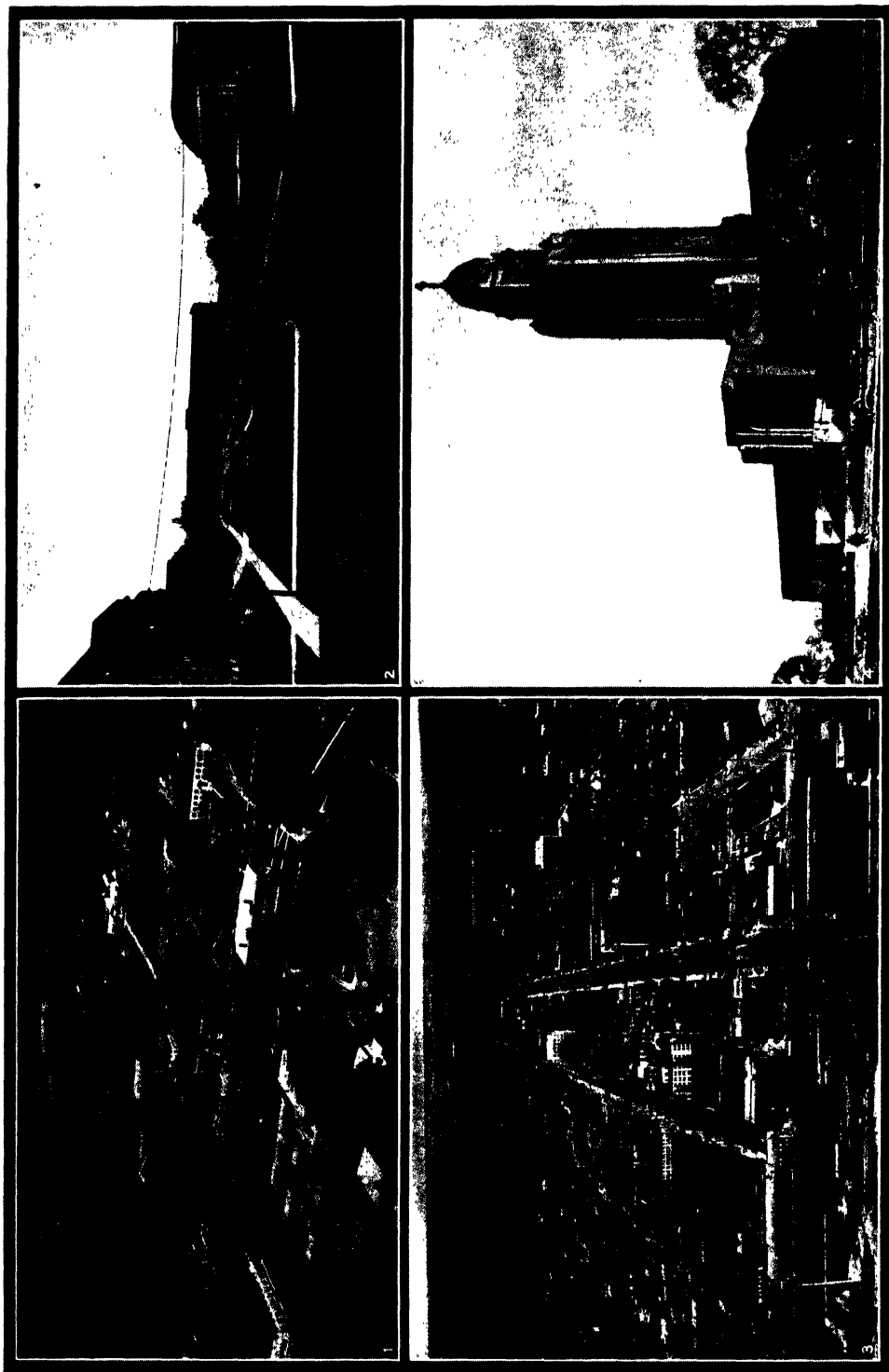


COURTESY OMAHA CHAMBER OF COMMERCE

### INDUSTRIAL AND AGRICULTURAL SCENES IN NEBRASKA

1. Field of wheat. Nebraska is the fourth largest wheat-producing state in America. 2. Section of the vast Omaha stockyards which receive 8,000,000 head of livestock annually. 3. Aerial view of the Omaha stockyards.

# NEBRASKA



1, 2, 3, COURTESY LINCOLN CHAMBER OF COMMERCE; 4, OMAHA CHAMBER OF COMMERCE

## NEBRASKA'S CAPITAL AND EDUCATIONAL INSTITUTIONS

1. College of Agriculture campus, University of Nebraska, Lincoln. 2. Section of the University of Nebraska campus.
3. Aerial view of Lincoln, looking east from the new Burlington Station. 4. New ten-million-dollar State Capitol Building. Bertram G. Goodhue, Architect.



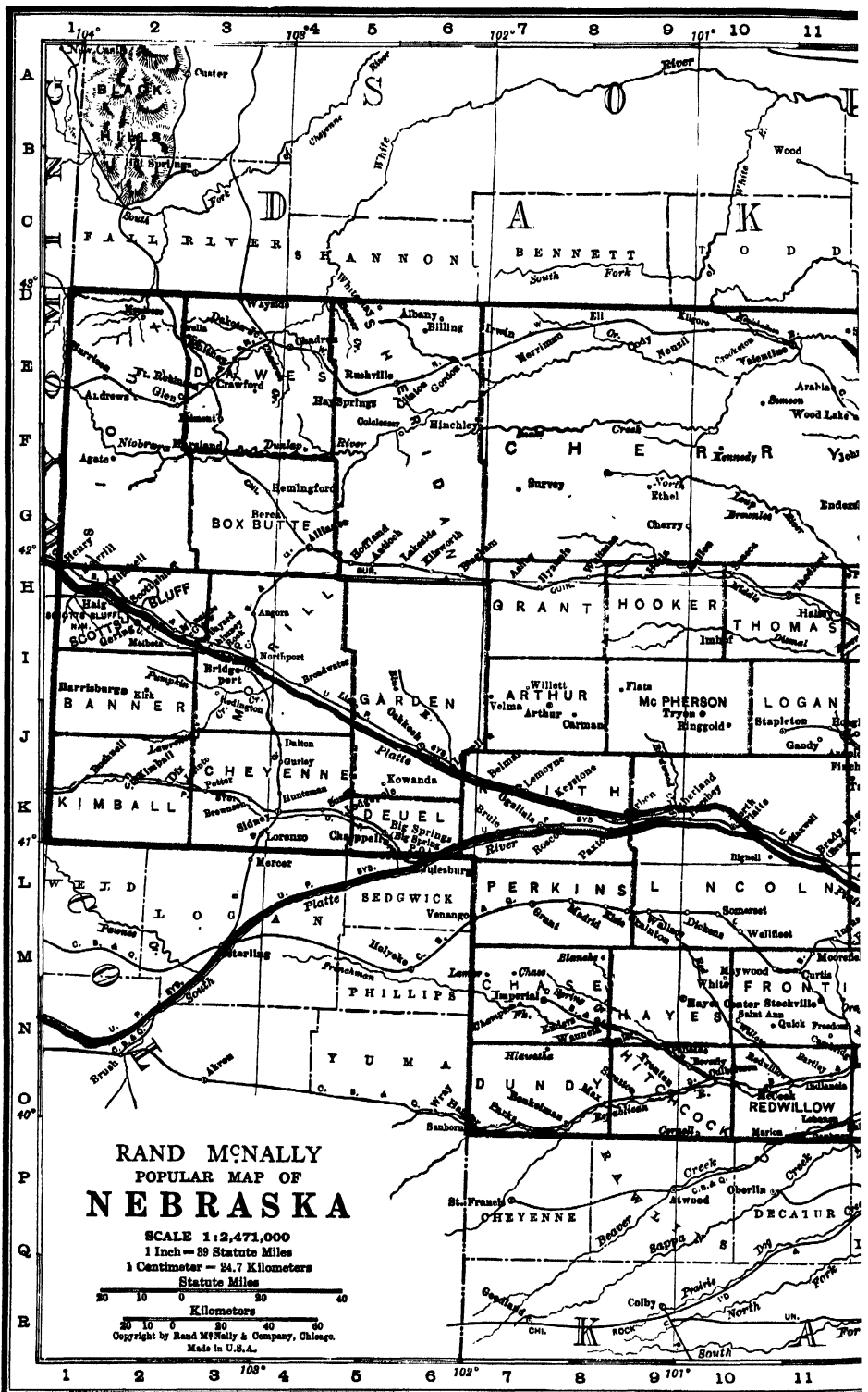
# NEBRASKA

Area 77,520 sq. m.  
Pop. 1,377,963

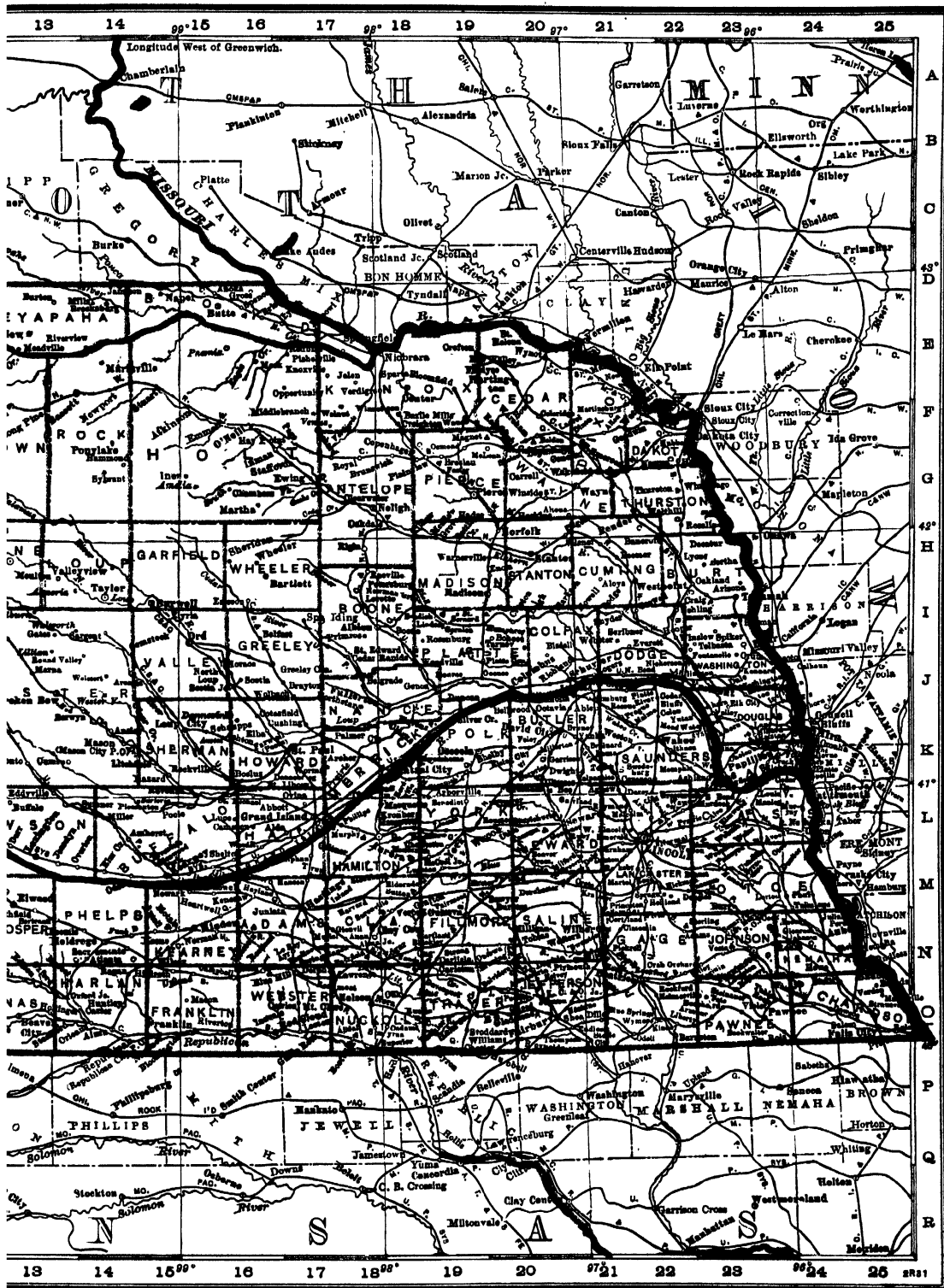
## PRINCIPAL CITIES

### Pop.—Thousands

- 1 Alinsworth. F 13
- 2 Albion. I 18
- 7 Alliance. G 4
- 1 Arapahoe. N 13
- 2 Ashland. K 23
- 1 Atkinson. F 15
- 3 Auburn. N 24
- 3 Aurora. L 18
- 2 Bayard. I 3
- 10 Beatrice. N 22
- 1 Bellevue. K 24
- 1 Benkelman. O 8
- 8 Blair. J 23
- 1 Bloomfield. F 19
- 1 Bridgeport. I 3
- 3 Broken Bow. J 13
- 1 Burwell. I 16
- 3 Central City. K 14
- 5 Chadron. E 5
- 1 Chappell. K 5
- 7 Columbus. J 20
- 2 Cozad. L 12
- 2 Crawford. E 3
- 1 Creighton. F 18
- 3 Crete. M 21
- 2 David City. K 20
- 1 DeSmet. O 19
- 1 Edgar. N 18
- 6 Fairbury. O 20
- 6 Falls City. O 25
- 1 Franklin. O 15
- 11 Fremont. J 22
- 2 Fullerton. J 18
- 2 Geneva. M 10
- 1 Genoa. J 19
- 3 Gering. H 2
- 2 Gordon. E 6
- 2 Gothenburg. L 12
- 18 Grand Island. L 17
- 2 Hartington. F 20
- 10 Hastings. M 17
- 4 Havelock. L 22
- 2 Hebron. O 19
- 3 Holdrege. N 14
- 1 Hooper. I 22
- 1 Howell. I 21
- 1 Humboldt. O 24
- 1 Imperial. N 7
- 9 Kearney. N 7
- 2 Kimball. K 2
- 3 Lexington. M 13
- 70 Lincoln. L 22
- 1 Louisville. L 23
- 1 Loup City. K 15
- 1 McCook. O 10
- 2 Madison. I 10
- 1 Minatare. I 2
- 2 Minden. N 15
- 2 Mitchell. H 2
- 7 Nebraska City. M 24
- 2 Neligh. G 18
- 11 Norfolk. H 20
- 1 N. Bend. J 21
- 12 N. Platte. K 10
- 1 Oakland. L 22
- 2 Ogallala. K 7
- 214 Omaha. K 24
- 2 O'Neill. F 16
- 2 Ord. I 15
- 1 Orleans. O 14
- 1 Osceola. K 19
- 1 Oxford. N 13
- 2 Pawnee City. O 23
- 1 Pender. G 21
- 1 Plainview. G 19
- 4 Plattsmouth. L 24
- 1 Randolph. G 20
- 2 Ravenna. L 15
- 2 Red Cloud. O 16
- 1 Rushville. E 5
- 1 St. Edward. J 18
- 2 St. Paul. K 17
- 3 Schuyler. J 21
- 2 Scottsbluff. H 2
- 2 Seward. L 20
- 3 Sidney. K 4
- 4 South Sioux City. F 22
- 2 Stanton. H 20
- 3 Superior. O 18
- 10 Sutton. M 18
- 1 Syracuse. M 23
- 2 Tecumseh. N 23
- 2 Tekamah. I 23
- 2 Valentine. E 11
- 3 Wahoo. K 22
- 1 Wakefield. G 21
- 1 Walthill. G 22
- 2 Wayne. G 21
- 2 Westpoint. I 21
- 1 Wilber. N 21
- 1 Winnebago. H 21
- 3 Wymore. O 22
- 6 York. L 19









contains abundant lime, and is by no means wholly unproductive. Alfalfa is grown successfully in irrigated districts, lack of sufficient moisture being the sole obstacle to crop production. Portions of the Bad Lands can be cultivated by irrigation or dry farming, but the areas totally destitute of ground water are not arable. In the west alkaline deposits are found in small areas known as gumbo soil. With adequate water supply, these alkaline soils may be reclaimed for grazing purposes. In the extreme west the so-called butte soil prevails; it is sandy, fine in texture and contains some calcareous matter.

**Agriculture.** Nebraska ranks among the leading agricultural states; its principal crops are corn, wheat, oats, hay, vegetables and sugar beets.

In 1930 44,708,565 ac. or 91% of the entire land area was in farms, 129,458 in number, with an average size per farm of 345.4 ac. and an average value per acre of \$55.81. Of the farm area, 22,343,612 ac. or 50% was crop land, and 20,798,031 ac. or 47%, pasture land. The total value of farm property was \$2,935,029,721, of which \$2,495,203,071 was represented by land and buildings; \$150,925,108, by implements and machinery; and \$288,901,542, by domestic animals.

According to the census of 1930 Nebraska produced in 1929 field crops to the value of \$299,107,260, ranking seventh among the states. It stood second in sugar beets, third in corn, wheat and rye, fourth in oats, fifth in hay and seventh in barley. The chief crops were grains, \$234,101,066; hay, \$41,702,606; vegetables, \$14,711,820; sugar beets, 983,523 tons, \$6,845,320, and fruits, \$1,691,929.

Corn, oats and wheat are the leading grain crops. Of 9,516,194 ac. devoted to corn, 8,589,965 ac. harvested for grain produced 216,020,274 bu. Oats were grown on 2,317,266 ac. with a yield of 70,733,080 bu., and wheat on 3,699,967 ac. with a yield of 53,867,855 bu. Other grains were barley, 15,264,262 bu., and rye, 2,746,587 bu.

Of the hay crop of 4,574,577 tons, valued at \$41,702,606, alfalfa contributed 2,089,045 tons and wild grasses 2,028,901 tons.

Among the principal vegetables were potatoes \$10,403,265, sweet corn \$164,707, tomatoes \$113,742, and watermelons \$106,324. The leading fruits included apples 633,598 bu., cherries 90,322 bu., plums and prunes 55,304 bu., pears 53,280 bu., and peaches 51,873 bu.

Farm products sold by cooperative marketing dropped from \$44,755,140 in 1919 to \$26,648,713 in 1929, and farm supplies purchased by this method from \$9,660,107 to \$4,441,475. Farm machinery and equipment in 1930 included 141,144 automobiles, 26,045 motor trucks, 40,729 tractors, 8,303 electric motors, and 45,902 stationary gas engines.

**Irrigation.** Although relatively a minor factor in the agriculture of the state, irrigation is of local importance in the valley of the Platte River as far east as Grand Island, and especially in the valley of its chief tributary, the North Platte, near the Wyoming

boundary. In the Census of 1930 irrigation operations are separately reported for 20 counties. The most extensive development is in the extreme west in Scotts Bluff, Sioux and Morrill counties, which contain about three-fifths of the irrigated acreage of the state. Most of the remainder is in Dawson, Dawes, Garden, Hitchcock, Keith and Lincoln counties.

The total number of irrigated farms was 4,602, with an aggregate area of 1,648,339 ac., of which 532,617 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$85,097,442, or an average of \$51.63 per ac. The total investment in irrigation enterprises to 1930 was \$21,386,319, and the average cost of maintenance and operation for 1929 was \$1.54 per ac.

**Animal Industry.** Cattle-raising, both for beef and milk production, and hog-raising are the chief livestock interests. According to the census of 1930, the rank of Nebraska among the states was second in swine, fifth in horses and sixth in cattle on farms; it also stood sixth in total value, \$288,901,542, of all domestic animals. Among the last named were 3,155,887 cattle reported from 119,151 farms or 92% of all farms in the state and valued at \$166,403,151; swine, 4,679,161 in number valued at \$61,316,256; horses, 754,296, \$39,927,472; mules, 98,973, \$7,210,241, and sheep, 496,411, \$3,453,381.

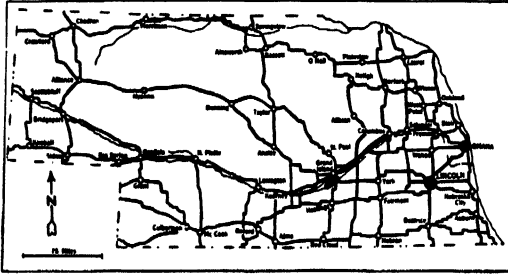
Of the cows on farms 723,305 were kept mainly for beef production and 691,228 mainly for milk production. In 1929, 292,937,813 gals. of milk were produced; the total value of dairy products marketed was \$30,400,089, including \$22,515,779 for cream sold as butterfat. The value of all poultry raised was \$20,519,614. The number and value of the chief kinds were chickens, 25,974,163, \$19,492,070; turkeys, 250,000, \$625,446; ducks, 274,349, \$224,359, and geese, 118,052, \$177,739. The chickens sold, 9,942,134 in number, were valued at \$7,750,911. Of 85,554,932 doz. chicken eggs produced, valued at \$21,538,525, 60,753,083 doz., with a value of \$15,298,348, were sold. The sheep industry yielded 2,466,689 lbs. of wool, valued at \$697,703. Honey, reaching a total of 1,293,019 lbs. valued at \$166,142, was produced from 39,225 hives.

**Fisheries.** There is little commercial fishing in Nebraska. The total catch for 1930, all of which came from the Mississippi River, amounted to but 135,000 lbs. valued at \$15,000. In the same year, the state issued 173,408 fishing licenses, receiving \$176,572 in fees. Four hatcheries are operated by the state at a cost, in 1930, of \$100,000. The output in 1930 was 415,230 trout, 314,384 bass and 1,371,765 other game fish. Fish liberated in Nebraska waters by the U.S. Bureau of Fisheries in 1930 included 173,000 trout of various species, 146,550 sunfish and 9,000 other game fish.

**Transportation.** Flatboats on the Missouri River were one of the principal means of transportation, prior to the advent of the railroad. The Union Pacific was the first steam railway to enter Nebraska, starting construction at Omaha in 1865. Now Omaha

is a center of transcontinental railway routes, whose branches honeycomb the state. The total railway mileage in 1930 was 6,174, and the principal systems were the Burlington, the Union Pacific, the Chicago & Northwestern, the Missouri Pacific and the Rock Island.

Two great automobile highways, the LINCOLN and the Detroit-Lincoln-Denver, cross the state from east to west, while several important trunk highways run



NEBRASKA STATE ROADS

north and south. Since 1917 the highway system has shown rapid and steady improvement. On Jan. 1, 1930 there were 99,275 mi. of highways, including 5,364 mi. of surfaced roads and 4,190 mi. of improved state highways. The aggregate highway expenditure during 1929 was \$19,342,975 of which \$8,389,619 was paid by the state and \$10,953,356 by county and local governments. The state gasoline tax produced an income of \$9,060,422 in 1930 as against \$3,039,927 in 1926. Motor vehicle registrations were 426,229 in 1930 compared with 338,719 in 1925. The growth of transportation by truck is indicated by the registrations, which rose from 37,003 in 1925 to 58,642 in 1930, or more than 60%. During the same period the number of buses in operation increased from 307 to 639, over 100%.

**Manufactures.** Agricultural resources, principally cereal crops and livestock, form the basis of the state's manufacturing industries.

According to the Census of 1930 Nebraska with manufactures for 1929 valued at \$484,168,409 stood twenty-eighth among the states, ranking fourth in butter, fifth in meat packing and eleventh in flour. Its 1,491 establishments gave employment to 6,540 officers and employees, who received \$14,466,307 in salaries, and to 28,212 wage earners, who were paid \$36,881,112 in wages. These factories used a total of 169,210 horse power, expended \$6,660,221 for fuel and power, and \$357,514,489 for materials and supplies, and added by the process of manufacture \$119,993,699 to the value of their output.

The outstanding factory industry is meat packing, the output of which, valued at \$208,994,805, represented 43% of the total manufactures of the state. Among other important manufactures, in order of value, were butter, \$47,873,628; flour, \$29,579,918; printing and publishing, \$18,477,401; bread, \$16,382,507; steam railway carshop construction and re-

pairs, \$13,887,644; coffee roasting and grinding, \$5,838,207, and poultry killing, \$5,261,406.

The chief manufacturing center is Omaha, which in 1929 produced an output valued at \$353,158,836, or 73% of the total manufactures of Nebraska. Of minor importance were Lincoln, with an output valued at \$22,666,542, and Grand Island, \$5,645,029.

**Commerce.** According to the census of 1930, there were in 1929 2,890 wholesaling establishments in Nebraska, with total sales of \$1,054,064,385. These organizations gave full-time employment to 17,268 men and women whose annual salaries and wages aggregated \$28,106,033. The chief wholesale distributing center was Omaha which reported sales of \$707,496,150, over 70% of the total for the entire state. Lincoln was also important.

The total sales of the 18,350 retail stores amounted to \$599,630,250. Sales per store averaged \$32,677; sales per capita were \$435.16.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive	3,775	\$141,469,456	23.59
General Mdse.	1,842	122,006,641	20.34
Food	3,492	92,303,519	15.39
Lumber & Bldg.	1,664	63,259,183	10.54
Apparel	1,054	34,278,688	5.72
Furn. & Household	661	21,710,090	3.63
All other stores	5,862	124,602,673	20.79

Total, all stores ... 18,350 \$599,630,250 100.00

**Finance and Banking.** The assessed value of all taxable property in 1928 was \$3,125,855,462. Nebraska has no state debt. Total state revenues in 1930 were \$23,024,159. The chief sources of income were property taxes, \$7,327,357, miscellaneous corporation taxes, \$12,182,779 and Federal aid for highways, \$2,380,056. Total expenditures were \$22,365,494. The principal payments were for public improvements, including highways, \$11,499,963, and ordinary expense, including operation of governmental departments, \$9,653,422.

There were 763 banks in Nebraska in 1930. Of these, 167 were national banks and 596 trust companies and state banks. Their total capital was \$40,346,600; their surplus and undivided profits, \$21,696,000. Total resources were \$451,078,000, with loans and discounts aggregating \$241,101,000. Demand and time deposits totaled \$239,294,000. Per capita demand and time deposits were \$244.80; per capita savings deposits, \$94.70. The total savings of \$131,250,000 were owned by 256,093 depositors. National bank circulation aggregated \$6,837,000.

**Government.** The legislative body of Nebraska consists of a Senate composed of 33 members and a House of Representatives of 100 members, all elected for terms of two years, meeting in biennial sessions unlimited in duration. The chief executive is the governor elected for terms of two years at \$7,500 per year. Other executive officers are the lieutenant governor, secretary of state, auditor, treasurer, superintendent of public instruction, attorney-general, and

commissioner of public lands and buildings. Judicial power is vested in a supreme court, district and county courts, justices of the peace, and police magistrates. The supreme court consists of seven judges elected for terms of six years at salaries of \$7,500 per year.

**Social Welfare Institutions.** A State Board of Control and Department of Public Welfare have general supervision of all charitable and penal institutions in the state. There is a girls' training school at Geneva, an industrial school for boys at Kearney, and an industrial home for girls at Milford. This last was started as a shelter for penitent women and girls and to provide them with employment; any child may be placed there by its parents. There is a home for dependent children at Lincoln, soldiers and sailors homes at Milford and Grand Island, a school for the deaf at Omaha and for the blind at Nebraska City. An institution for feeble minded of all ages is at Beatrice. Hospitals for the insane are located at Lincoln, Norfolk, and Ingleside (Hastings). At Lincoln is an orthopaedic hospital also. At the tuberculosis hospital in Kearney if patients are not able to pay, the county must be responsible for the expense. The reformatory for women is at York and the reformatory for men and the state prison are at Lincoln.

**Education.** The first school in the state was a mission school operated at Bellevue in 1836. Passage of a school law in 1855 brought about the opening in that year of a public school at Brownville. By 1877, there were 6 schools in operation in the state. In 1928-29 there were 7,245 elementary schools, having 267,312 pupils and 14,216 teachers; and 476 high schools with 60,282 pupils and 3,079 teachers. Children from 7 to 15 years of age are required to attend school for not less than 6 months each year.

The number of persons from 5 to 20 years of age attending school in 1930 was 332,943, or 76.5% of the population within the ages specified, as compared with 292,747, or 70.6%, in 1920. Persons 10 years of age and over unable to read and write in 1930 numbered 12,725, as compared with 13,784 in 1920. The percentage of illiteracy in 1930 was 1.2, and in 1920, 1.4.

The state institutions of higher learning include the University of Nebraska at Lincoln, and normal colleges at Peru, Kearney, Wayne, and Chadron. The most widely known private institutions are Creighton University at Omaha, Nebraska Wesleyan University at Lincoln, Hastings College at Hastings, Union College at College View, Cotner University at Lincoln, and the University of Omaha at Omaha. The Nebraska Public Library Commission has its headquarters at Station A, University Campus, Lincoln.

**Population.** In 1930 Nebraska ranked thirty-second among the states with a population of 1,377,963 or an average of 17.9 per sq. mi., an increase of 81,591 or 6.3% over 1920. The population rose from 28,841 in 1860 to 1,066,300 in 1900, 1,192,214 in 1910, and 1,296,372 in 1920. In 1930 there were 1,353,702 or 98.2% whites, 13,752 or 1.0% Negroes, 6,321 or 0.5% Mexicans, and 3,256 or 0.2% Indians. Of the

whites, 1,238,356 were native born and 115,346 were foreign born. Of the foreign stock, including foreign born, foreign and mixed parentage, 168,329 or 35.1% were German, 52,031 or 10.8% Czechoslovakian, 50,087 or 10.4% Swedish. The rural population was 891,856 or 64.7% of the total, an increase of 790 or 0.1% from 1920; the urban population was 486,107 or 35.3% of the total, an increase of 80,801 or 19.9% since 1920. In 1930 the four largest cities were: Omaha, 214,006; Lincoln, 75,933; Grand Island, 18,041; Hastings, 15,490.

**Occupations.** In 1930 507,008 persons, or 36.8% of the population, were gainful workers 10 years old or older; 82.3% of these were males and 17.7% were females; 87.2% were native white; 10.7% foreign-born white; 1.4% Negro, and 0.6% other races. In agriculture, the principal occupation, 197,199 persons were engaged; of these 130,004 were farmers and 47,126 farm wage workers. Among other leading occupations, with number of workers, were manufacturing, 80,989; trade, 67,305, including 18,264 retail dealers and 22,435 salespersons; domestic and personal service, 42,735; transportation and communication, 41,780; professional service, 39,664, including 17,244 school teachers, 2,353 men and 14,891 women, and clerical service, 30,320.

## HISTORY

Coronado touched the southern border of the state in 1540. Spanish and later French explorer-traders occasionally visited the Nebraskan tribes—Cheyenne, Arapaho, Brule and Oglala, Sioux, Pawnee, Otoe, Omaha and Ponca—without leaving identifying record. French maps after 1700 reveal fairly accurate knowledge of the Indian villages and principal streams. The Mallet brothers crossed the state in 1739. Nebraska, as part of LOUISIANA, was ceded by France to Spain in 1762, retroceded in 1800, and acquired by the United States in 1803 (*see LOUISIANA PURCHASE*). An era of trade, exploration (*see LEWIS AND CLARK, PIKE, FRÉMONT*) and exploitation of the fur trade ensued. Manuel Lisa, Pierre and Auguste Chouteau, the lieutenants of JOHN JACOB ASTOR, and other adventurers conducted the fur trade in Nebraska, and led expeditions into the upper Missouri River region. Trading posts were established at Ft. Calhoun, 1807; at Bellevue soon after; at Omaha in 1825, at Nebraska City in 1826. From 1805 to 1812 a part of the Territory of LOUISIANA, included in the Territory of MISSOURI until Missouri became a state, Nebraska in 1821 was left without organization. In 1834 it was included in the "Indian Country," which Congress designed to be the permanent home of the aborigines. Yet overland emigration to the Far West (*see OREGON TRAIL; MORMONS*) traversed Nebraska, gave rise to temporary settlements near Omaha and depots of supply at Bellevue, Plattsmouth, Nebraska City and Fort Kearney, and made the country generally known before it received territorial status on May 30, 1854 (*see KANSAS-NEBRASKA BILL*). After a bitter contest, the capi-

tal was placed at Omaha. A territorial period marked by "wildcat" banking ventures, Indian wars, agitation for a Pacific Railroad and for free homesteads, and two refusals, for motives of economy, of proposed statehood, ended when a state constitution was adopted by 100 votes, June 2, 1866. Nebraska, having accepted the Constitutional provision that restricting suffrage to white men would not be enforced, was proclaimed a state on Mar. 1, 1867. The completion of the Union Pacific Railroad, the extermination of the buffalo herds, the removal of the capital to the more central location of Lincoln, and the end of Indian hostilities in 1877, advanced the settlement of the state. An era of large ranches and cattle barons gave way to small farms and "homesteaders," who, despite visitations of grasshoppers and severe droughts, tenaciously extended the improved acreage of the state. Politics assumed an agrarian tinge. Except during the Populist period, the Republican party has usually been successful. The peculiarities of Nebraskan politics were never more noticeable than in 1928 when the state voted for Hoover and in 1930 when it sent the insurgent Republican George W. Norris, who supported the Democrats in 1928, to the Senate. In 1932 Nebraska voted for Roosevelt and reelected Charles W. Bryan, Democrat, governor.

**BIBLIOGRAPHY.**—Harrison Johnson, *History of Nebraska*, 1880; J. S. Morton and others, *Illustrated History of Nebraska*, 1902.

**NEBRASKA, UNIVERSITY OF**, at Lincoln, Neb., a coeducational state institution, founded in 1869. It is composed of colleges of Arts and Sciences, Agriculture, Engineering, Law, Pharmacy and Medicine, the Graduate and Teacher's colleges; and schools of Fine Arts, Nursing, Journalism, Agriculture and Teacher's College High School. The Nebraska School of Agriculture, at Curtis, and the agricultural experiment stations at North Platte, Valentine and Scottsbluff are part of the university. The College of Medicine at Omaha is adjacent to the Child Saving Institute, the clinical facilities of which are controlled by the university. The grounds and buildings were valued in 1931 at \$11,320,902. In the library of 251,798 volumes are special collections on the French Revolution and Entomology. In 1930 there were 11,313 students, and a faculty of 332 headed by Chancellor EDGAR A. BURNETT.

**NEBRASKA CITY**, a city in southeastern Nebraska, the county seat of Otoe Co., situated on the Missouri River, 50 mi. south of Omaha. Served by bus lines and two railroads, it is a trade center and shipping point for grain and fruit. The city has feed mills, a drill shop, brick and tile works, a cannery, packing houses and stockyards. John Brown's Cave is near by. Nebraska City is the site of Arbor Lodge State Park, Arbor Lodge having been the home of J. Sterling Morton, the founder of Arbor Day. The city was incorporated 1857. Pop. 1920, 6,279; 1930, 7,230.

**NEBRASKA WESLEYAN UNIVERSITY**, a coeducational institution at University Place, Lincoln,

Neb., was organized in 1887 through the merging of a number of small Methodist colleges. It is made up of the College of Liberal Arts and Sciences, Teachers' College, and School of Fine Arts. The productive funds in 1931 totaled \$1,082,965. The library contained 24,394 volumes. In 1931-32 there were 520 students and a faculty of 55, headed by Chancellor I. B. Schreckengast.

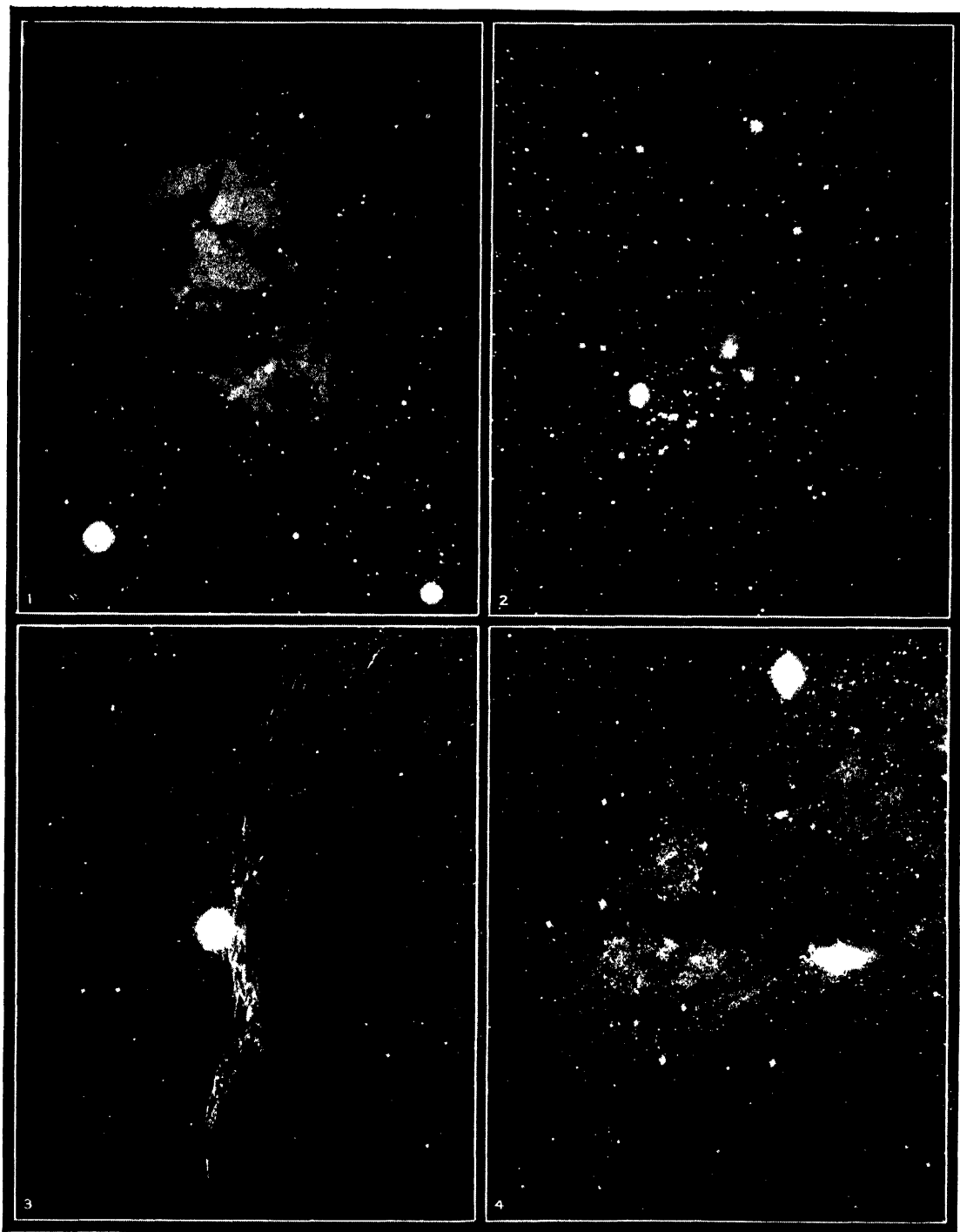
**NEBUCHADNEZZAR**, known as Nabu-kudur-usur II on the cuneiform inscriptions, was the chief ruler of the neo-Babylonian empire in the 7th century B.C., and one of the greatest monarchs of the ancient world. As general in the army of his father, Nabopolassar, he distinguished himself at the Battle of Carchemish, against Necho, King of Egypt, in 605 B.C. He inherited the kingdom the same year and reigned for 43 years. His conquest of Judea and capture of Jerusalem brought about the Babylonian Captivity of the Jews. He captured Tyre after a siege of 13 years, 585-72, when he invaded Egypt to set Amasia on the throne. His most notable achievement however was in Babylon, where he re-built the walls, restored the temples, constructed canals, and created the famous Hanging Gardens of Semiramis, for his Midian wife, Amytis, which came to be reckoned one of the seven wonders of the ancient world. Herodotus says he made the walls 55 mi. in circumference, 340 ft. high, 85 ft. thick, with 250 towers and 100 brass gates. Rawlinson states that he examined the bricks of at least a hundred temples near Baghdad, and found on them all the stamp of Nebuchadnezzar. He died B.C. 561.

**NEBULAE**, hazy, cloud-like, luminous masses in the sky, often with ill-defined outline. They are divided into two principal groups, the galactic nebulae and the extra-galactic nebulae. The former group, of which less than one thousand are now known, are as their name indicates connected with the MILKY WAY. They may again be subdivided into three classes, the dark, the diffuse and the planetary nebulae.

A dark nebula consists simply of a cloud of cosmic dust, which obscures the light of the stars behind it and thus is apparent simply as a portion of the sky in which few stars are seen. The diffuse nebulae, usually very irregular in outline, are probably similar in constitution to the dark nebulae, and shine only because of their proximity to a bright star. Their light may be simply reflected light or light emitted by the individual atoms in the dust cloud under the stimulation of the intense radiation of a very hot star. The Orion nebula, visible to the unaided eye, is a good example of this class of nebulae.

A planetary nebula usually presents a sizeable disk, fairly sharply defined, with a very hot star in its center. The spectrum, as well as that of many of the diffuse nebulae, contains bright lines, including those formerly attributed to NEBULIUM. The planetary nebulae average about 0.1 light year in diameter, or 100 times larger than the solar system. The diffuse and dark nebulae are much larger, and may reach sizes from 10 to 100 light years. All of them are exceed-

## NEBULAE

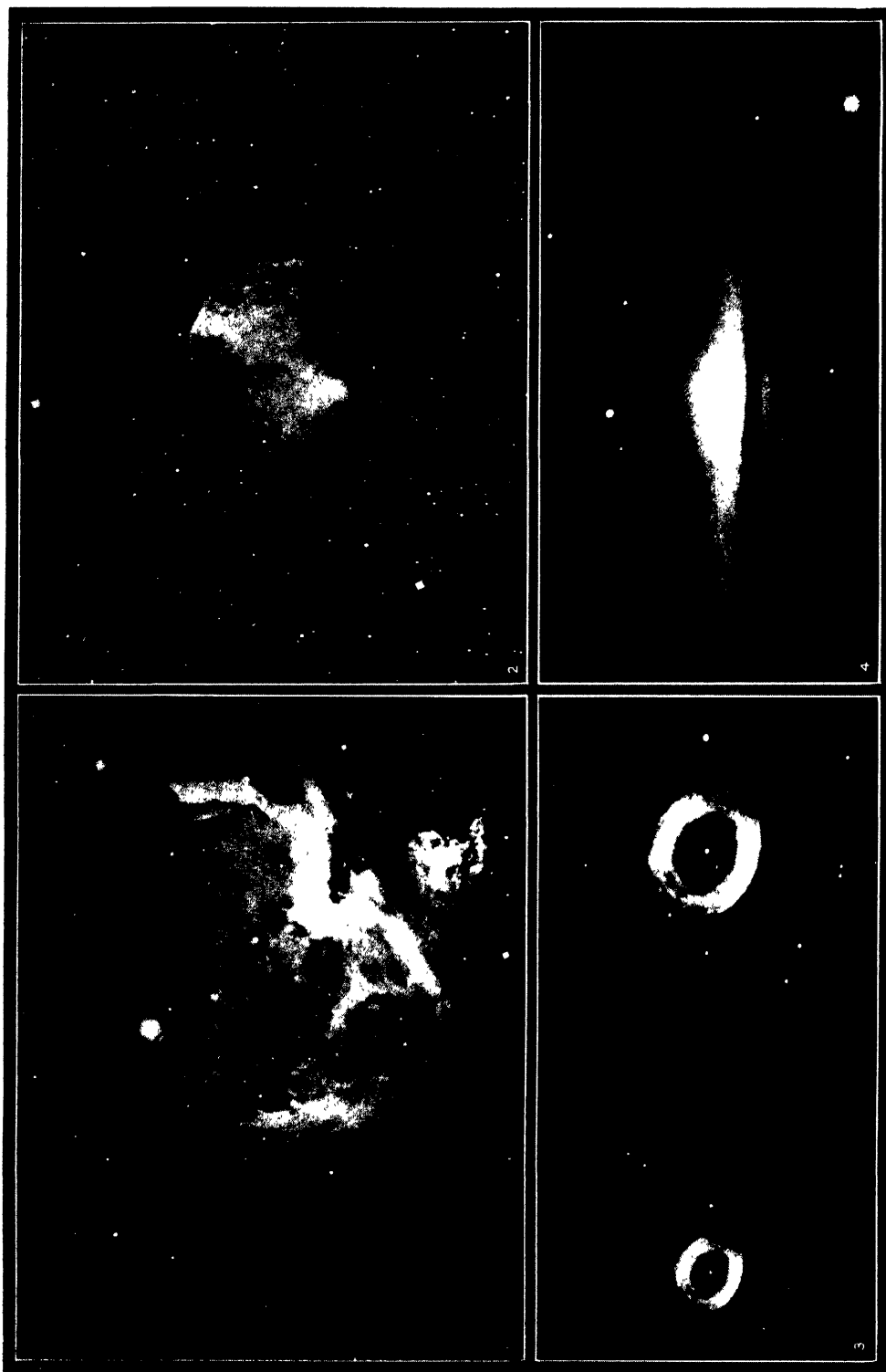


COURTESY MT. WILSON OBSERVATORY

### NEBULAE—THE UNIVERSES OF STARS

1. Trifid nebula in Sagittarius. 2. Irregular nebula in Scutum Sobieski. 3. Filamentary nebula in Cygnus. 4. South preceding region in the Great Nebula in Andromeda, resolving nebulousity into star images.

# NEBULAE



COURTESY MOUNT WILSON OBSERVATORY

## DIFFUSE AND PLANETARY NEBULAE

1. Great Nebula in Orion, one of the larger diffuse nebulae.
2. Dumb-bell nebula in Vulpecula, a planetary nebula.
3. Ring nebula in Lyra, seen through 60- and 100-inch telescopes.
4. Spiral nebula in Virgo, viewed from the edge.



ingly tenuous in composition and have a density of not more than one-millionth of one-billionth of normal air. The extra-galactic nebulae are entirely different objects, very much larger in extent, and apparently bearing no relation to the Milky Way system. They may be arranged in a definite series, according to their shape, the progression in this series from amorphous, spherical nebula, through elliptical nebula, to spiral nebula, being interpreted as a difference in age and development. The spherical nebulae are held to be the youngest; the spirals, which appear to be no other than huge aggregations of stars, the oldest. Apart from the Magellanic Clouds and similar objects, which appear to be in an even more advanced stage than the spirals, the nearest of these extra-galactic nebulae is nearly 1,000,000 light years distant.

It is estimated that about one million such objects, ranging up to 100 million or a billion light years in distance, are within reach of the 100-inch telescope. Their dimensions are very large, for which reasons they are often called island universes. The Andromeda nebula, the only one visible to the unaided eye, has a diameter of roughly 50,000 light years. The majority of them are probably smaller. The extra-galactic nebulae appear to recede from us with high velocities, increasing with the distance. These apparent velocities are now interpreted partly as a result of the curvature of space. W. J. L.

**NEBULAR HYPOTHESIS**, the theory, tentatively advanced by Laplace, and explaining the origin of the solar system as due to a rapidly rotating nebula, which, as it contracted in the course of time, threw off rings of matter that condensed into the planets. It has now been shown to be untenable on mathematical grounds. See COSMOGONY.

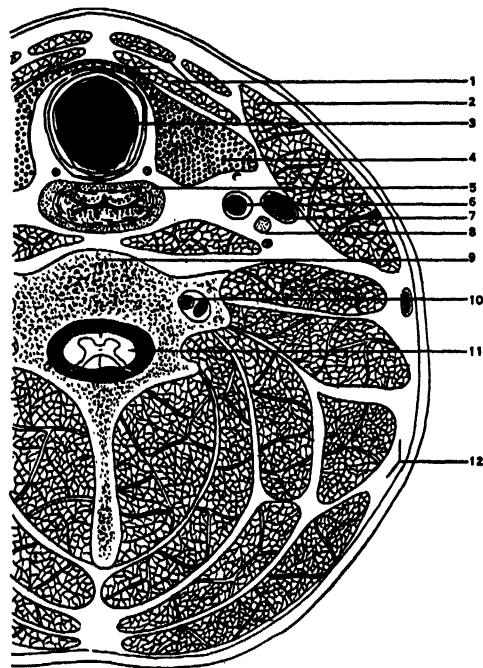
**NEBULIUM**, a hypothetical gas, formerly assumed to be the chief constituent of the NEBULAE, but now shown to be merely a mixture of oxygen and nitrogen.

**NECK**, a broad cylindrical column connecting the head with the trunk. Its bony framework is formed by the seven cervical vertebrae (see figure, C.V.; see also SKELETON) which join one another in a manner which allows movement of the head in all directions. The spinal cord (S.C.) passes through the tube formed by the superimposed rings of the vertebrae. In front of the vertebrae is the esophagus (Es.) which carries food from the mouth and pharynx to the stomach.

In the esophagus is the trachea or wind-pipe (Tr.), connecting the nose and pharynx with the lungs. At the upper end of the trachea is the LARYNX or voice-box. The THYROID GLAND (Th.) lies on either side of the trachea. There are several small muscles (A.M.) in front of the trachea. At the side of the esophagus are the carotid artery and jugular vein, the main vessels of the head, and the vagus nerve. These are contained in a sheath of connective tissue. External to the described structures is the large oblique muscle of the neck, the sterno-cleidomastoid (Sm.). The remainder of the neck is occupied by the

muscles which move the head, vertebral column, shoulder, and upper ribs (D.M.). W. J. S. K.

**NECK**, a towering volcanic rock, representing the exposed "plug" or mass of hardened lava filling the vent of an extinct volcano, left upstanding after the ancient cone has been worn away. Noted examples



CROSS SECTION OF HUMAN NECK THROUGH MIDDLE OF SIXTH CERVICAL VERTEBRA

1 A.M., anterior muscles; 2 Sm., sternocleidomastoid muscle; 3 Tr., trachea; 4 Th., thyroid gland; 5 Es., esophagus; 6 C.A., carotid artery; 7 J.V., jugular vein; 8 V.N., vagus nerve; 9 C.V., cervical vertebra; 10 V.A., vertebral artery; 11 S.C., spinal cord; 12 D.M., dorsolateral muscles

are the Rock of St. Michael at Le Puy, in southern France, the Tepee Butte or Devil's Tower north of the Black Hills in Wyoming. In the Mt. Taylor region of New Mexico, such roughly circular, buttelike hills vary from a few hundred yards to a mile or more in diameter, and from 1,000 to 2,000 ft. in height.

**NECKER, JACQUES** (1732-1804), French statesman and financier, was born at Geneva of a Brandenburg family, Sept. 30, 1732. After 1750 he was engaged in banking at Paris and in 1764 married Susanne Curchod of Lausanne who induced him to enter politics. In 1768 he became a director of the East India Co., and in 1776 Minister of Finance. He attempted to fund the huge floating debt which threatened national bankruptcy, and in 1781 published his famous *Compte Rendu*. In this treatise he exposed many of the evils of the maladministration of the nation's finances, notably the enormity of the pension system but he did not reveal the real financial condition of the treasury. The statement aroused a storm

of opposition among the favorites of the Court, and this, together with the enmity of the Queen, resulted in his dismissal in 1781 but none of his successors could extricate the nation from financial difficulties and Necker was recalled in 1788. He then advocated calling the Estates General but when it met he failed utterly in leadership, offering no constructive program for the reform of the treasury. Despite this, the nation still believed in him and his dismissal, July 11, 1789, together with the assembly of royal troops at Versailles, led directly to the attack on the Bastille, July 14. To satisfy the popular clamor he was again recalled, but proved himself quite incapable of coping with the financial problems of the Revolution. Unlike Mirabeau who saw the need of drastic economic and social readjustments and an entire revision of the system of taxes, Necker tried to meet the situation by financial expedients. In Sept. 1790 he resigned again and withdrew to Coppet, Switzerland, where he died Apr. 9, 1804.

**NECROMANCY**, literally the black art or casting spells to work evil on others. The term belongs to the range of MAGIC and refers to such beliefs as the evil eye, whose glance brings disaster, to curses and incantations, and specifically to spells and blights through the possession of unusual powers. The modern term **HEXING** shows the survival of the belief. See also **DIVINATION**; **OCCULT**; **WITCHCRAFT**.

**NECROSIS**, or death of tissue, a term applied in a more restricted sense to the destruction of bone by infections of various sorts. The most usual form of bony necrosis is acute osteomyelitis. The condition occurs usually in children of poor health. Following a comparatively minor injury which may not puncture the skin, considerable deep pain and tenderness are complained of. The periosteum which covers the bone has become the seat of bacterial growth and pus formation. The periosteum becomes stripped from the bone by the resultant pus, and the underlying bone is deprived of its nourishment and dies. It also becomes a prey of the infection, which may spread to the marrow cavity. The dead bone is discharged in fragments, called sequestrae, through apertures which communicate with the exterior, and the periosteum compensates for the destruction of bone by forming a thick column of new bone outside the main sequestrum. Necrosis of bone may also be the result of tuberculosis or syphilis.

Treatment consists of opening and free scraping of the diseased bone by a surgeon. See also **GANGRENE**.

**NECTAR**, in classical mythology, the drink of the gods, described as red wine. The Greeks said those who drank it became immortal. In early mythology nectar and **AMBROSIA** were identical, but later ambrosia was the food and nectar the drink.

**NECTARINE**, any smooth skinned peach. It is not a hybrid between a plum and a peach or a peach and an apricot, but is produced either from a peach pit or as a bud sport on a peach branch. In either case it may reproduce itself by seed or sport back

from nectarine to peach or vice versa. Occasionally its fruits are half peach and half nectarine. For discussion of this anomaly see *The Peaches of New York* by Hedrick and *Animals and Plants under Domestication* by Darwin. Nectarines are propagated and cultivated like PEACHES. They are less popular mainly because they are more subject to attacks of curculio and because most varieties are inferior to the choicest peaches rather than because of the absence of any standard of excellence.

The New York State Agricultural Experiment station has devoted considerable attention to nectarines and has originated several new varieties. Among established kinds are Elruge, Boston, Downton, Hardwicke, Pitsmaston Orange, Early Newington, Lord Napier, Advance and Humboldt. In California white varieties of nectarines are grown on a commercial scale for canning and drying but only to a fractional extent as compared with peaches. M. G. K.

**NEEDHAM, JAMES GEORGE** (1868- ), American biologist, born in Virginia, Ill., Mar. 18, 1868. He received his B.S. and M.S. degrees from Knox College in 1891 and 1893, respectively. Continuing his studies, he attended Johns Hopkins (1893-94) and was the Goldwin Smith fellow at Cornell, receiving his Ph.D. degree from there in 1896. Since 1907, he has been a professor of entomology and limnology at Cornell. Among his publications are *General Biology*, 1909; *Natural History of the Farm*, 1913; *The Life of Inland Waters*, with J. T. Lloyd, 1915; *Guide to the Study of Fresh-Water Biology*, with P. R. Needham, 1927; *Leaf-Mining Insects*, with Frost and Tothill, 1928; and *Flandbook of the Dragonflies of North America*, with H. B. Heywood, 1929.

**NEEDHAM**, a town in Norfolk Co., eastern Massachusetts, situated near the Charles River, 10 miles southwest of Boston. It is served by the New Haven Railroad and by motor buses. Needham is largely residential but there are knitting and surgical instrument factories. It became a town in 1711. Pop. 1920, 7,012; 1930, 10,845.

**NEEDLE GUN**. See **RIFLE**.

**NEEDLES**, a city in San Bernardino Co., southeastern California. It is situated on the Colorado River, on the eastern edge of the Mohave desert, a short distance from the Mohave Mountains, and 70 mi. northeast of San Bernardino. The Santa Fé Railroad serves the town. Needles is a division point on the Santa Fé lines, and has railroad car shops. Pop. 1920, 2,807; 1930, 3,144.

**NEEDLES**, long slender pieces of steel, having a point and an eye for holding a thread which fastens two or more materials together. There are a variety of shapes on the market varying from the common household needle with a point at one end and eye at the other for the thread, to needles with the eye near the point and with long shanks, which are used in power operated machines as for sewing soles on shoes. Different steels are used, depending on the purpose; for instance a harder steel is required for ordinary sewing than in making hosiery.

**NEENAH**, a city in Winnebago Co., eastern Wisconsin, situated at the junction of Lake Winnebago, Little Lake Butte Mortes and Fox River, opposite the city of Menasha. Bus lines, lake and river craft and four railroads serve the city, which is a shipping market for grain and dairy products. Neenah has various manufactures, including paper and paper products, veneered doors, knit goods and cotton waste. The city was founded in 1843 and chartered in 1873. Pop. 1920, 7,171; 1930, 9,151.

**NEERWINDEN, BATTLES OF**, two military engagements fought in the neighborhood of the Belgian village of Neerwinden, 16 miles southeast of Louvain. On July 29, 1693, the marshal of Luxembourg there defeated the combined English and Dutch in the War of the Grand Alliance. Almost exactly a century later, on Mar. 18, 1793, the Austrian armies, commanded by Prince Josias of Coburg, defeated the French forces led by Gen. Charles Dumouriez.

**NEGAUNEE**, a city in Marquette Co., northern Michigan, situated 12 mi. southwest of Marquette. Bus lines and three railroads serve the city, which is a shipping point for garden crops and dairy products. Iron ore is found in this region. Gloves are the principal local manufacture. Negaunee was incorporated in 1873. Pop. 1920, 7,419; 1930, 6,552.

**NEGLIGENCE**, in law, failure of one who is engaged in some course of conduct to come up to the standard imposed by the law. The standard established in the COMMON LAW is what a reasonably prudent man would do under the circumstances. If damage results from negligent action there is liability. It is for a jury to say whether any item of conduct in controversy conforms to the standard; the court defines the standard in its charge and determines whether there is enough in the evidence to raise a question for the jury.

**NEGOTIABLE INSTRUMENT**, an unconditional promise or order, in writing, for the payment of a certain sum of money at a determinable time or on demand, made payable either to order or bearer (Negotiable Instruments Law, Section 1). The principles governing negotiable instruments were derived from the LAW MERCHANT and are incorporated into the Negotiable Instruments Law which has been enacted in every state of the Union. The law was patterned upon the British Bills of Exchange Act, 1882. The uniformity in this branch of the law is attributable to the needs of commercial convenience. If the law was conflicting in the several states numerous business transactions would be subject to uncertainty and delay flowing from the application of contrary rules.

Among the various forms which negotiable instruments assume are promissory notes, drafts (*see* BILLS OF EXCHANGE), CHECKS, BONDS, and TRADE ACCEPTANCES. A negotiable differs from a non-negotiable instrument in that it may be transferred by delivery or by indorsement and delivery, the existence of valuable consideration is presumed and a holder in due course holds the paper free from defenses available to prior

parties among themselves and may recover the full amount on the face of the instrument (N.I.L., Sections 16, 24, 57 and 58). To constitute a holder in due course it is essential that the instrument is complete and regular upon its face; that the instrument was acquired before it was overdue and without notice to the holder of prior dishonor; that the holder took the instrument for value and in good faith; and that at the time the instrument was negotiated to the holder he had no notice of any infirmity or defect in the title of the person negotiating it (N.I.L., Section 52).

A negotiable instrument is discharged by payment in due course by the principal debtor (N.I.L., Section 119). But in the case of dishonor by non-payment or non-acceptance, notice thereof must be given by the holder to each indorser and the drawer. If such notice is not given, either orally or in writing, an indorser or drawer is discharged from liability to payment of the note or bill (N.I.L., Section 89). *See also* INDORSEMENT. C. F. Wz.

**NEGRI SEMBILAN**, one of the group of Federated Malay States under British protection. The Federated State of Negri Sembilan includes the states of Sungai Ujong, Johol, Jelebu, Rembau and five smaller ones. The total area is 2,550 sq. mi. Pop. 1921, 178,762. The forests yield valuable timber, while the staple products are sugar, rubber, rice, coconuts, tapioca and spices. Seremban is the capital of the state. The port of Arang-Arang is 25 mi. from Seremban and is connected with it by a railway. Pop. 1921, 178,762.

**NEGRIITIAN**, division in anthropology. *See* RACES OF MANKIND: *Negroid Group*.

**NEGRITO**. *See* RACES OF MANKIND: *Negroid Group*.

**NEGRO**, a term used in the United States to designate all persons with any discernible degree of African blood. In 1930 the population of Negroes numbered 11,891,143, or about 10% of the total population, and represented an increase, since 1920, of 13.6%. The number of Negroes with white admixtures is estimated at about a third of the population, while Indian admixtures account for about a fifth. There are other white-Indian-Negro admixtures.

Four-fifths of the Negro population reside in the southern states. In this section, where they constitute a fourth of the total population, there is a most rigid and indiscriminate enforcement of the color line in most civic and virtually all social relations. The steady but small movement of this population for several decades to the North and West was greatly accelerated between 1915 and 1924 by a combination of economic and social factors produced by the World War. More than a million Negroes migrated from their old setting in the rural South to the highly industrialized North. This phenomenal shift has been attributed to the sudden expansion of northern industries following the War and a drastic curtailment of immigration from southern Europe, coincident with the generally lower wages of the South, a succession

of crop failures, an intensification of economic competition with white workers, inferior schools, oppressive social restrictions, and the hysteria of a mass movement. The precipitous movement to the cities intensified social and racial problems in the schools, in housing and in health, and was marked for a period, by a swift succession of race riots in the North. Notably, however, it increased the number of Negroes engaged in unskilled and skilled work in industry.

The movement of this population southward and westward of the original black belt has been even larger and the proportion living in cities has increased from 20% to about 40%. The largest urban concentrations now are in the North. There are important numbers in the building trades, tobacco, iron and steel, coal mining, blast furnaces and in longshoring, with fairly large numbers employed as unskilled and skilled workers in automobile manufacturing, slaughtering and meat packing and railway maintenance. Numbers are increasing in the professions and there has been a moderate development of Negro businesses.

Illiteracy has declined from about 90% in 1860 to less than 20%. In 1920 this rate ranged from 2.9 in New York to 38.5 in Louisiana, these figures corresponding roughly with the amounts spent per capita by the respective states for Negro education. About 68% of the Negro children of school age are in elementary schools, and there are about 18,000 college graduates.

The mortality rate of Negroes is 60% greater than that of the white. The greatest scourges are tuberculosis, organic heart disease, pneumonia and cancer, but there have been notable reductions. Between 1900 and 1920, the Negro life span was increased by 8 years for males and 7.3 for females.

The course of Negro-White relations in the United States has been a progressive though difficult adjustment of the Negroes to the American standards and culture, and of the whites to the changing status of the Negro. See also RACES OF MANKIND: *Negroid Group*. C. S. J.

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**NEGRO ART IN AMERICA.** Although folk-songs have long played an important part in the life of the American Negro, the first truly intellectual expression of the race in America was in poetry. A slave in Boston, Mass., PHILLIS WHEATLEY, wrote some of the first Negro poems in the latter half of the 18th century, and was followed in the next century by a series of poets in which the name of PAUL LAWRENCE DUNBAR was outstanding. It was not until after the World War, however, that Negro poetry generally became an achievement, in place of a noble attempt, in art. The leading poets, which included COUNTÉE CULLEN, JAMES WELDON JOHNSON and Langston Hughes, for the most part abandoned much of the conventional dialect of the Negro, and sought depth and greater purity of form.

To-day spirituals remain as the highest expression of

the American Negro in music. The Fisk Jubilee Singers introduced them in the 1870's, and they have since been popularized further by Negro singers, Roland Hayes, Paul Robeson and others. Somewhat resembling these spirituals are the "blues" which have become widely popular. Ragtime, somewhat older in origin, has been largely superseded by jazz. In addition, there is a great bulk of folk music in the plantation- and work-songs sung in Negro districts.

Negro drama has been greatly stimulated in the present century by the establishment of "little theaters" (see LITTLE THEATER MOVEMENT IN AMERICA) which in many cases have encouraged the Negro dramatist and produced his work with Negro actors. Several important plays have been written by white playwrights about Negroes, notably Eugene O'Neill's *Emperor Jones* and *All God's Chillun Got Wings*, Paul Green's *In Abraham's Bosom*, and Marc Connelly's *Green Pastures*. Several Negro schools and colleges have instituted courses designed to encourage and train Negro dramatists.

In Negro painting, sculpture and design there was at first a tendency to follow the well-beaten path of academic painting, but this has recently been replaced by a movement toward individual expression of Negro ideals and temperament. Among the outstanding artists are Meta Warrick Fuller, sculptress, Palmer Hayden and Albert Smith.

**NEGRO EDUCATION.** Until the Civil War, the Negro in the United States was practically barred from receiving any education. In the South, teaching the Negro, whether slave or not, was prohibited by law. In the North, in spite of strong opposition, a few private schools for Negro children were founded by whites, but up to 1830 no Negro could enter any college. In 1861 the American Missionary Association opened a school for Negroes at Hampton, Va., which later became the well-known Hampton Institute. Other schools were opened in 1862 in South Carolina and Tennessee, and the Freedmen's Bureau, established in 1865, carried on the educational work supported by the Government and individual whites. Not until 1870 was there an organized effort to establish public schools for Negroes, though in some parts of the South colored children were admitted to public schools. The advisability of training Negroes for teaching their own race was early recognized, and in 1873 state normal schools were opened. At first considerable stress was laid on cultural training for Negroes, but it was soon realized that training the Negro to be self-supporting was the great need.

Negro education has been supported most generously by several educational foundations, namely the Jeanes Foundation, PEABODY EDUCATIONAL FUND, GENERAL EDUCATION BOARD, JOHN F. SLATER FUND and JULIUS ROSENWALD FUND. In 1910 through such financial aid Virginia appointed a state agent for Negro rural schools. The next year several other southern states followed her example, and by 1919 all had appointed similar state agents.

Until 1914 most financial aid was given institutions

directed by missionary agencies of northern churches, but since then the tendency has been to work with the state public school systems which have provided for Negro education. The need for higher education for the Negro has been recognized and is receiving increased support. See NEGRO; TUSKEGEE NORMAL AND INDUSTRIAL INSTITUTE; HAMPTON INSTITUTE; HOWARD UNIVERSITY.

**NEGROPONTE.** See EUBOEA.

**NEGUS**, an Abyssinian title of a ruler, the full title of the Emperor being *negus nagasti*, or "king of kings."

**NEHEMIAH, BOOK OF**, in the Old Testament, was probably at one time a part of the Book of CHRONICLES. In the Douay Bible it forms, with the Book of EZRA, part of I and II Esdras. Its authorship has been attributed to Ezra, and though some think it arose at a later period, it is reasonable to believe it is based on traditions of Ezra. It narrates the story of the high priests down as far as Jaddua, who was in office at the time of Alexander the Great, and tells of Nehemiah's mission to Jerusalem, and his efforts to restore its walls in spite of the interferences of Sanballat.

**NEIDHART VON REUENTHAL** (c. 1180-c. 1250), Middle High German poet, was born in Bavaria about 1180. A Bavarian knight, he went on the crusade of Leopold II of Austria against Egypt in 1217-19 and subsequently resided in Vienna at the court of Duke Frederick the Quarrelsome. He was the originator of the medieval lyric which satirized the simpler life of the peasantry. He also had an important and lasting influence on the Volkslied, or folk song. The poet died in Vienna about 1250.

**NEIHARDT, JOHN GNEISENAU** (1881- ), American poet, was born near Sharpsburg, Ill., Jan. 8, 1881, and educated at Nebraska Normal College and the University of Nebraska. He lived among the Omaha Indians in 1901-07, to study their character and history. He became poet laureate of Nebraska, 1921, Professor of Poetry at the University of Nebraska, 1923, and literary editor of the *St. Louis Post Dispatch* in 1926. Neihardt's publications include *The Divine Enchantment*, *Man-Song*, *Death of Agrippina* and *The Quest*.

**NEILSON, ADELAIDE** (1848-80), English actress whose real name was Elizabeth Ann Brown, was born at Leeds, Mar. 3, 1848. She made her first stage appearance at Margate, and at 17 made her London debut as Juliet, her best part. Her great beauty and dramatic gifts made her notably successful as Amy Robsart, Isabella, Julia, Rosalind, Beatrice and Lady Teazle. She toured America in 1876 and 1879. According to those who knew her, Adelaide Neilson was a woman of domestic tastes, without desire for public life. She died at Paris, Aug. 15, 1880.

**NEILSON, WILLIAM ALLAN** (1869- ), American educator, was born at Doune, Scotland, Mar. 28, 1869. He graduated (A.M.) from the University of Edinburgh in 1891 and in 1896 from Har-

vard University (A.M.), taking his Ph.D. at the latter university in 1898. Neilson taught in Scotland and Toronto, Can., from 1891-95. From 1898-1906, he taught successively at Bryn Mawr, Harvard and Columbia University, returning to Harvard as professor of English in 1906. Here he continued until elected, 1917, president of Smith College. During his presidency he introduced several innovations in the college curriculum. One of the most interesting is the arrangement for sending juniors majoring in French to the University of Grenoble and the University of Paris for one year's study, the work there being done under the direction of the Smith College faculty. The plan has now been extended to Madrid and Florence for students of Spanish and Italian.

Among his writings are *Essentials of Poetry*, 1912; *The Facts About Shakespeare*, 1913; *A History of English Literature*, 1920; and *Robert Burns*. He was editor of *Shakespeare's Complete Works* (Cambridge Poets), 1906; *Chief Elizabethan Dramatists*, 1911; *Harvard Classics Shelf of Fiction*, 1917; and *Roads to Knowledge*, 1932. Neilson was associate editor, working with Charles W. Eliot, of the *Harvard Classics*, 1909, and editor of the literature department for *The National Encyclopedia*, 1932.

**NEISSE**, a city and fortress in the Prussian province of Upper Silesia, located on the Neisse River about 29 mi. southwest of Oppeln. The important buildings of the city include the fine St. James' Church of 1430, the rathaus of 1499, other buildings with Renaissance gables and the former episcopal palace. The chief industries of the city include machine, textile, and wax goods factories and grain mills. There is trade in grain, lumber and leather. Neisse was built in the 10th century and was at one time a principality capital. In 1199 it became part of the bishopric of Breslau and, after many vicissitudes, became Prussian in 1742. Pop. 1925, 32,604.

**NEJD**, a kingdom of Arabia comprising the vast desert from Syria in the north to the Arabian Sea in the south bounded by Hejaz in the west and the Persian Gulf in the east. The kingdom embraces an area of over 400,000 sq. mi. and has a population estimated at about 3,000,000. Riyadh located in central Arabia with a population of 30,000 is the capital of the kingdom. The King, Ibn Saud, who resides at Riyadh is also ruler of Hejaz. Other important towns of Nejd are Jufuf, Mubarratz, Shaqra, Hail, Hauta, Anaiza and Jauf. All of them have populations of between 10 and 20 thousand. Sheep, horses and camels are raised in Nejd which also grows grains and fruits of various kinds, particularly dates. Exportations include hides, horses, camels and dates while imports are sugar, coffee, rice and tea. See also HEJAZ; ARABIA.

**NELSON, HORATIO, VISCOUNT** (1758-1805), English admiral, was born at Barnham, Thorpe, Norfolk, Sept. 29, 1758. His early life, passed in almost every quarter of the globe, was always distinguished by a sense of seamanship that was remarkable. But his progress was slow. It was not until 1793 that

he was made captain of a ship of the line and in the next 14 years, adding one success to another, finally emerged as the most celebrated figure in British naval history. At the battle of Cape St. Vincent (1797), he attacked with his single ship a superior force of Spanish vessels, and came off victorious. For this he received the Order of the Bath and was made an admiral, despite the fact that he had disregarded orders in acting on his own initiative. He became really famous the following year at Aboukir Bay, where he won a brilliant victory, known as the battle of the Nile, Aug. 1, 1798. By skillful maneuvering he completely destroyed the French fleet which had transported Napoleon's army to Egypt.

Three years later, in 1801, he captured the Danish fleet at Copenhagen and broke up the League of the North. But his greatest victory came on Oct. 20, 1805 off Cape Trafalgar after four months spent in the effort to meet the allied French and Spanish fleets. With 27 ships he attacked the combined French and Spanish fleet of 33, broke through their line and in a ship-to-ship action captured more than half the allied fleet, disabling a number of the others. Early in the action Nelson was wounded. He lived long enough, however, to learn that the victory had been won. As he entered the fight he hoisted the signal, "England expects every man to do his duty." The undisputed supremacy of the sea was thus assured to England. Nelson died on the afternoon of the Battle of Trafalgar.

**NELSON**, a town of British Columbia, Canada, situated about 375 mi. east of Vancouver, at the head of navigation on the western arm of Kootenay Lake. Served by the Canadian Pacific and Great Northern railroads, it is the outlet of the fruit, lumber and mining products of the region. There are iron, gas and engineering works, and an extensive electric power plant. Pop. 1921, 5,230; 1931, 5,992.

**NELSON RIVER**, the principal river of Manitoba, Canada. It issues from the northern end of Lake Winnipeg, flows in a northeasterly direction through a series of lakes and empties into Hudson Bay through the estuary known as Port Nelson. It is in effect the lower course of the Saskatchewan. Throughout its length of 430 mi. the Nelson is deep, wide and swift. It discharges all the waters collected by Lake Winnipeg from an area of 450,000 sq. mi. River steamboats can ascend 80 mi. from its mouth. Stations of the Hudson Bay Company are situated near its mouth.

**NELSON'S MONUMENT**, an imposing memorial column of HORATIO VISCOUNT NELSON in TRAFALGAR SQUARE, London, England. The huge granite column, copied from a Corinthian column of the Temple of Mars Ultor at Rome, was erected in 1843 by William Railton, has a total height of 184 ft., and is crowned by a colossal statue of Nelson, 17½ ft. high, designed by E. H. Baily. Its bronze capital was cast from cannon of the *Royal George*, the bronze reliefs of the pediment from captured French cannon. At its base are four bronze lions by Landseer.

**NELSONVILLE**, a city in Athens Co., southeastern Ohio, situated on the Hocking River, 68 mi. southeast of Columbus. It is served by the Chesapeake and Ohio Railroad. Nelsonville is an industrial center, manufacturing bricks and clay products, but engaged principally in coal mining. Oil, gas and clay are found in this region, and corn is the chief crop. There are several interesting caves in the vicinity. Pop. 1920, 6,440; 1930, 5,322.

**NEMACOLIN'S PATH**, a famous Indian trail from the Potomac to the Ohio River. Several routes from Virginia and Maryland converged at Wills Creek (now Cumberland, Md.) on the Potomac. Thence the trail ran westward through the mountains, passing the upper Youghiogheny River, and the scene of the Battle of Great Meadows (see FRENCH AND INDIAN WAR); crossing the main Youghiogheny at the present Connellsville, and thence to the Forks of the Ohio. The path, named after a noted Delaware chieftain, was a traders' path from earliest times, and became the most important route to the Ohio valley. Braddock's Road (see BRADDOCK'S DEFEAT) was a widening of this trail.

**NEMESIS**, in Greek mythology, goddess of retributive justice. Hesiod makes her the daughter of Nyx (see NOX); another story says she was the mother of HELEN, wife of MENELAUS; that ZEUS visited her as a swan and she laid an egg from which Helen came. Nemesis was sought by those whose love was unrequited and by those engaging in any kind of combat. She punished vain boasters.

**NEMOPHILA**, a genus of diffuse annual herbs of the waterleaf family, several of which are grown in gardens for their attractive blue or white flowers. There are about 18 species native to western North America; among the best known is the BABY-BLUE-EYES found in California.

**NEODYMIUM**, a metallic chemical element, belonging to the RARE EARTHS. Its chemical symbol is Nd, atomic weight 144.3%. It was discovered by von Welsbach in 1885 as one of the components of didymium, previously supposed to be an element. It is not as scarce as most of the rare earths and occurs in the minerals monazite and cerite. Solutions of its salts are usually faint purplish in color and show a strong and characteristic absorption spectrum.

**NEO-HUMANISM**, a literary movement best represented by the school of IRVING BABBITT and PAUL ELMER MORE. It differs from Renaissance humanism in that the former was a protest against other-worldliness; the new humanism is a protest against a too-narrow this-worldliness. Striving to apply the principle of the "golden mean" in conduct, it emphasizes moderation, poise, balance and harmony. Yet it would distinguish between modern and modernism, humanism and humanitarianism. In the issues between naturalism and supernaturalism it sympathizes with the supernaturalist. It is opposed to the concepts of progress and humanitarianism, to all forms of social uplift. It regards itself as the enemy of pragmatism and all philosophies of flux; and for BEHAVIORISM in

psychology it can feel only contempt. It distrusts science and would have us return to intuition.

The term "The New Humanism" has also been used by Julian Huxley to designate the attitude taken by H. C. Tracy in his book *Towards the Open*. This new humanism is scientific humanism. It not only would apply science to the problems of living together, but would humanize science. Leon Samson, in his *The New Humanism*, gives a critique of various points of view in the interests of a scientific humanism.

**NEO-KANTIANISM**, a philosophical movement which started in Germany around 1860. Its impetus came from the questions about knowledge raised by IMMANUEL KANT. The movement is best represented by Herman Cohen, and Windelband and Rickert were considerably influenced by it. This revival of interest in Kant's philosophy soon spread to other countries. It is also known as neocriticism.

**NEOLITHIC PERIOD**, or New Stone Age, the stage of culture in which men had developed the art of polishing their implements of flint and other hard stones. In the Old Stone Age (see **STONE AGE**) these implements were chipped or flaked, but not yet polished. The Neolithic Period is well illustrated by discoveries in the lake dwellings uncovered in Switzerland, during a drought in the winter of 1853-54. At Lake Neuchâtel 50 of these dwellings were found; on the lake of Geneva, 40; on Lake Constance, 40; on Lake Zurich, 10. At Robenhausen, on a small lake in the Canton of Zurich, 100,000 piles were found, on which houses had been built averaging 30 by 25 feet.

Dwellings near the shore are Neolithic. Those farther out belong to the Bronze Age. At Robenhausen, among the bones of 30 mammals, six were of domestic animals, including cattle, sheep, goats, pigs and dogs. There were also a few bones of the horse. Barley, wheat and millet were grown, and flax was woven on looms. Mealing stones are abundant, and baskets and pottery are present. Similar lake dwellings are found all over the world. Herodotus mentions them in the Balkans. Modern Venice, Ravenna and the East Indies have examples of lake dwellings. See **ARCHAEOLOGY**.

**NEO-MALTHUSIANISM**. Malthus, an English clergyman, challenged to thought by French Revolutionary communism, pointed out, 1798, to the great comfort of the conservatives, that the eternal pressure of man's increasing numbers tends to divide the products of the fields and other resources into ever smaller portions for each wage-earner. Neo-Malthusianism was the name given long afterwards to those who challenged Malthus' pessimistic views that morality allowed no other check to population than late marriage preceded by continence. Neo-Malthusians proposed early marriage with mechanical checks to conception (see **BIRTH CONTROL**), except when children were desired. The legal right to publish methods for cohabitation without child-bearing, established in England through the Bradlaugh-Besant trial, 1877, was soon followed by a decline in the birth rate in England especially among the well-to-do English,

and also among the poor, and in Ireland and other nations. Whether the birth rate declined because the new methods became widespread or whether, on the contrary, the fight for them was won because European conditions dictated a lower birth rate, is debatable. Recent researches into human society in every age and country has disclosed another force quite as persisting as Malthus' pressure of population, i.e., the innate resistance of human societies to any over-population dangerous to the **STANDARDS OF LIVING** already attained. The physical norm of eight descendants to each pair is hindered not only, as among animals, by violence and famine, but far more by the human practices of late marriage, taboos on intercourse, birth control, **POLYANDRY**, infanticide, celibacy, **PROSTITUTION**, and abortion. The economic standards of each differing human society are established after population has been more or less stabilized by some combination of these limiting practices.

C. H. R.

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**NEON**, a chemical element belonging to the group of the **RARE GASES**; symbol Ne, atomic weight, 20.18. It was discovered by Ramsay and Travers in 1898, and is a constituent of the atmosphere to the extent of one part in 60,000. It is a colorless and odorless gas which boils at  $-210^{\circ}$  C. When subjected to an electric discharge, neon sends out light of an intense orange-red color on which is based its present popularity in advertising signs and for airport beacons.

**NEON LAMPS**. See **GASEOUS-CONDUCTOR LAMPS**.

**NEOPHYTE** (a Greek word, meaning newly planted), originally, one who had been accepted as a member of a secret society, as for instance the Eleusinian Mysteries in ancient Greece. In the early Church the name was used to designate the newly baptized, who wore white clothes from Holy Saturday until the first Sunday after Easter, which is also called Whitsunday (Latin *Dominica in albis*) and Low Sunday or *Quasimodo* (Latin "like unto the newborn"), whose introit was I Peter 2:2: "As newborn babes desire the sincere milk of the word, that ye may grow thereby." In later times the term was applied to one entering a religious order as a **NOVICE**.

**NEO-PLATONISM**, a pantheistic, mystical philosophy best represented by **PLOTINUS** (d. 270). In this philosophy the world is conceived of as an overflow from God, and the problem it must solve is how to get back to its original source. In this process of the world's birth through a series of overflows from God, and its return to him through a series of regressions, the idea of emanation is central. In the descent from the higher to the lower forms of existence three emanatory stages are recognized; likewise in the ascent from the lower to the higher forms of being. The first emanatory journey is through the stages of spirituality, animality and corporeality; the return journey through those of perception, reasoning and mystical intuition. The material world has been generated by

a fall from spirituality, and is reabsorbed into its source as knowledge is able to transcend sense by mystical insight.

**NEOPTOLEMUS.** See PYRRHUS.

**NEO-PYTHAGOREANISM**, a movement of the early Christian era centering its attention on the Pythagorean concept of number. Much use was made of the number one. The movement was influenced by the early Pythagorean element in Plato's thought, and soon developed more elaborately in the form of **NEO-PLATONISM**. A similar movement appeared in Italy in the time of the Renaissance.

**NEOSHO RIVER**, a river of Kansas, rising in Morris Co. in the east central part of the state. It flows first southeast into Oklahoma and then generally southward to its junction with the Arkansas River near Fort Gibson. Throughout its course of about 400 mi. the river runs mainly through level farm lands and drains an area estimated at 12,600 sq. mi. Its total fall is 1,030 ft. The Cottonwood River flows into it from the west at Emporia. Other important cities on its course are Iola, Kans., and Miami, Okla.

**"NEP."** See UNION OF SOCIALIST SOVIET REPUBLICS, HISTORY OF.

**NEPAL**, an independent kingdom of India, extending for 525 mi. along the southern slope of the Himalayas and comprising an area of 54,000 sq. mi. It is bounded on the south and west by British India, on the east by Sikkim and on the north by Tibet. The state, especially the northern part, is very mountainous, containing the highest peaks of the Himalayas, among them being MOUNT EVEREST, Kinchinjunga, Dhanlagiri, and Gosain Than. In the south there is a level plain where rice, wheat, maize, tobacco, sugar-cane, barley, tea and other crops are produced. In this section there are also extensive forests which yield valuable timber. The state is reported to be rich in minerals, particularly copper, iron and lead. Cattle, skins and hides, timber, tobacco, spices, drugs and gums are the chief exports. Kathmandu, in the southern part of the state, is the capital. Nepal is ruled by a native monarch, with the executive power delegated to a prime minister. A British envoy resides at the capital but the state enjoys complete independence. Most of the inhabitants are Hindus. Pop. about 5,600,000.

**NEPENTHE**, in Homer's *ODYSSEY*, a powerful drug which Polydamna, Queen of Egypt, gives to Helen of Troy. It was supposed to eliminate all cares and dull all woes. The name has also been used to designate an imaginary island in the Mediterranean, closely resembling the island of Capri, in Norman Douglas's *South Wind*, 1925.

**NEPENTHES**, a numerous genus of pitcher plants of the nepenthes family, mostly herbs of boggy soils climbing by tendrils. There are about 60 species native to the Old World tropics and north Australia, several of which, together with numerous artificial hybrids, are grown in greenhouses as curiosities. The end of the tendril usually develops into a pitcher-like structure with a lid projecting over the mouth. Near

the entrance and for some distance below it are honey glands. Insects, attracted by the honey, enter the pitcher, are eventually drowned, and portions of their bodies digested by a proteolytic enzyme secreted by the plant. See also INSECTIVOROUS PLANTS.



NEPENTHES, A PITCHER PLANT  
(*Nepenthes mixta*)

**NEPHELITE**, a rock-forming mineral commonly of white, gray or flesh color, with a greasy appearance. It consists of the silicate of sodium and aluminum, like the FELDSPAR albite, but contains less silica. It crystallizes in the HEXAGONAL SYSTEM. Nephelite is found in certain IGNEOUS ROCKS, such as some SYENITES, but is not a common mineral. See also MINERALOGY; PETROLOGY; LEUCITE.

**NEPHRITIS**, or inflammation of the kidneys, may be acute or chronic. Acute nephritis follows the specific diseases, especially scarlet fever, and less often measles and diphtheria. Chilling is an important predisposing cause. Poisoning with turpentine, potassium chlorate and carbolic acid produce acute kidney inflammation.

The symptoms at the onset of the disease are headache, puffiness of the eyes, face and ankles, nausea and vomiting, constipation and fever. The urine is diminished in amount and contains blood, albumin and casts.

The outlook is always serious. In favorable cases there is improvement in a few days to one or two weeks. Death may occur from uremia, extension of the edema, or collection of fluids in the tissues of the body, and from secondary infection.

The treatment consists of the use of proper diet, and the encouraging of excretion by the skin through



hot baths, wet packs or hot-air baths. Excretion by the bowels is also encouraged by saline purges.

Subacute, or chronic nephritis of the nephrosis type, is often the result of a persistent local infection, particularly in the tonsils. The urine contains large amounts of albumin and there is much edema of the tissues of the body.

There are two main types of chronic nephritis, parenchymatous and interstitial. In the parenchymatous type the kidney is enlarged and the inflammation involves the tubules in the kidney rather than the connective tissue. The chief symptoms are edema, nausea, vomiting, loss of appetite, headache, anemia, and weakness. This type follows attacks of acute nephritis. The urine is reduced in amount, contains much albumin and casts. The outlook is always grave. In the treatment a high protein diet, limited in salt with little fat and moderate amount of carbohydrate, is used.

In chronic interstitial nephritis, there is an increase in the fibrous tissue in the kidney. The kidneys are small. The disorder is rare before forty years. Contributory causes are overeating, overwork, syphilis, and lead poisoning. Arteriosclerosis is an important cause.

The symptoms at the beginning of the disorder consist of headache and dizziness, breathlessness, frequency of urination and general weakness. The urine is increased in quantity, pale in color, with traces of albumin, a few casts and occasionally blood. Edema is rare except when there is associated heart disease.

The disorder may last for many years with fair health and activity. No cure is possible. Treatment is directed toward retarding the progress of the disease by removing contributory factors, namely, overwork, worry, overeating and the use of alcohol. *See also BLINDNESS, MEDICAL ASPECTS OF; PERICARDIUM, DISEASES OF.* W. I. F.

**NEPOS, CORNELIUS** (c. 99-c. 24 B.C.), Roman historian. His lost works include a universal history *Chronica* and a sort of golden treasury of famous anecdotes in Roman history *Exempla*. Of his *De Viris Illustribus*, a series of brief biographies of distinguished Romans and foreigners in 16 books, 25 lives have come down to us. These biographies, for the most part of Greek generals, but also including lives of Hannibal and Hamilcar, are short and easy, and consequently much read in our schools to-day.

**NEPTUNE**, god of the sea. *See* POSEIDON.

**NEPTUNE**, the eighth planet in order of distance from the sun. It was the first planet whose existence was proved from mathematical calculations before it had been discovered, viz., from the perturbations it produced in the path of Uranus. Its place had been predicted with such accuracy that when it was actually discovered in 1846, it was found within one degree of the predicted place. Neptune revolves about the sun in 165 years at an average distance of 2,800 million miles, and appears as a star of the eighth magnitude, well visible through a small telescope. Its diameter

is 31,000 miles, nearly 4 times larger than that of the earth; its mass is 17 times that of the earth. It appears to rotate on its axis in 15 hours. Neptune has one satellite, called Triton, which revolves around the planet in less than 6 days at a distance of 220,000 miles; it is probably a little larger than the moon.

**NEREIDS**, in classical mythology, daughters of the sea god NEREUS and Doris, daughter of Oceanus, were sea nymphs, about 50 in number. They were usually attendant on POSEIDON or AMPHITRITE who was herself a Nereid, and were represented as maidens with fishes' tails. THETIS, mother of ACHILLES, and GALATEA, beloved of POLYPHEMUS, the Cyclops, were two of the best-known Nereids.

**NEREUS**, in Greek mythology, a sea god, father of the NEREIDS, was son of Pontus and GAIA and husband of Doris, the Oceanid. Nereus had the power to assume any form. He is represented as a calm old man carrying a trident.

**NERI, PHILIP, ST.** (1515-95), Italian churchman and founder of the Oratorian Order, was born at Florence, July 21, 1515. Of good birth and with an excellent education, Neri nevertheless forsook worldly ways and entered on a unique sort of neighborhood missionary work. In later life he was called "The Apostle of Rome." In 1548 he founded the Confraternity for Pilgrims and Convalescents at Rome, and in 1556 commenced to organize those institutes that came to be known as Oratories. These were unconventional congregations of middle-aged churchmen who lived together, each at his own expense. In 1587 Neri was appointed superior for life of the congregations he had helped to organize. Eleven years later he persuaded Pope Clement VIII to withdraw the bull of excommunication he had issued against Henry IV of France.

He died at Rome on May 26, 1595, and was canonized by Gregory XV in 1622. His feast day is celebrated on May 26.

**NERNST, WALTER** (1864- ), German chemist and physicist, was born at Briesen, June 25, 1864. In 1887 he became assistant to W. OSTWALD at Leipzig, in 1891, professor at Gottingen, and in 1905, Director of the Berlin Institute of Physical Chemistry. He became President of the Physico-Technical National Institution in 1922 and contributed greatly to the advance of theoretical knowledge of electricity, isotopes, and heat. He invented the electric lamp named for him.

**NERO** (37-68 A.D.), Roman emperor 54-68 A.D. He lost his father Gnaeus Domitius Ahenobarbus at the age of three. His ambitious mother, AGRIPPINA the Younger, in 49 A.D. married the emperor Claudius, persuading him to adopt Nero as son and successor. Nero was carefully trained in philosophy and rhetoric by the Stoic SENECA. Despite the good influence which Seneca and Burrus, prefect of the praetorian guard, exerted over Nero during the first few years of his reign, Nero contrived the death of Britannicus, the son of Claudius, whom he feared as a rival. Also resenting the restraints imposed upon him by his mother Agrippina, he compassed her death. In 62

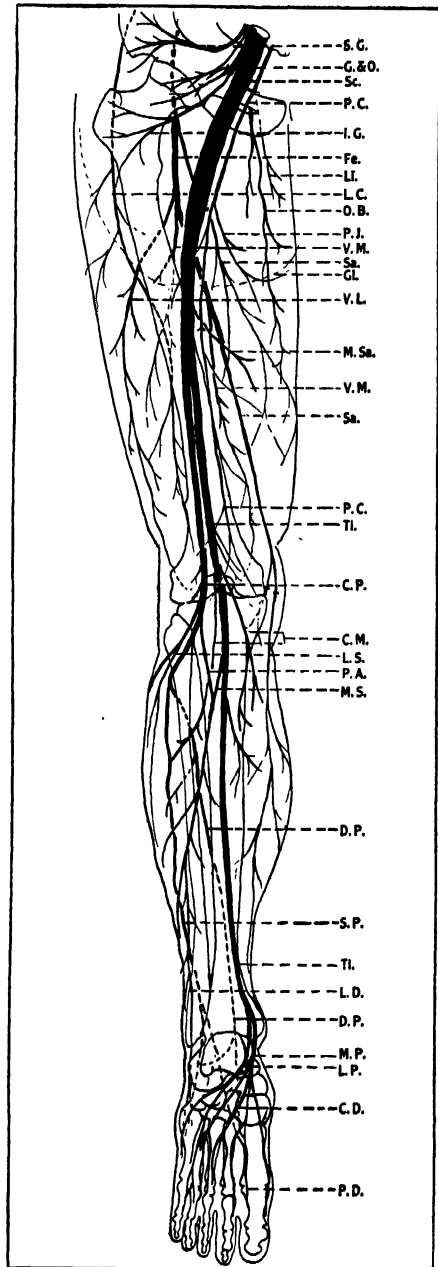
A.D. Burrus died and Seneca withdrew. After this Poppaea, the mistress of Nero, and Tigellinus, the new prefect of the praetorian guard, encouraged the licentious tendencies of their imperial master. Nero's brutal sensualism manifested in Rome and on his travels, and his neglect of public welfare lowered him in popular esteem. Moreover, his fear of conspiracies both actual and imagined led to the condemnation of many of the suspects, including Seneca, LUCAN, and PETRONIUS. Finally the news of revolts in the provinces, culminating in the proclamation of Galba as emperor by the senate, led Nero to commit suicide before falling into the hands of his executioners. His reign is memorable for the great fire of 64 A.D. which destroyed a large part of Rome and led to a systematic searching out and persecution of the Christians by Nero. With his death the Julio-Claudian family ceased to control the destinies of Rome.

**NERUDA, JAN** (1834-91), Czech poet, was born at Prague, Bohemia, July 10, 1834. He was educated at the University of Prague and traveled extensively in Europe and the Near East. Many volumes of critical and humorous sketches were written for the literary review *Narodni Listy* and Neruda's short stories of life in Prague have become distinguished examples of Czech realism. *Cosmic Songs*, 1878, effectively established his reputation as an unusually original poet. Neruda died at Prague, Aug. 22, 1891.

**NEURAL, GÉRARD DE** (1808-55), French writer whose real name was Gérard Labrunie, was born at Paris, May 23, 1808. His work includes poems, prose romances and stories, and a drama, *L'Alchimiste*, written with Alexandre Dumas. Especially noted is his *Vers Dorés*. Gérard, a great admirer of Germany, was influenced by the German poets, Goethe and Heine. Mentally deranged, he killed himself at Paris, Jan. 25, 1855.

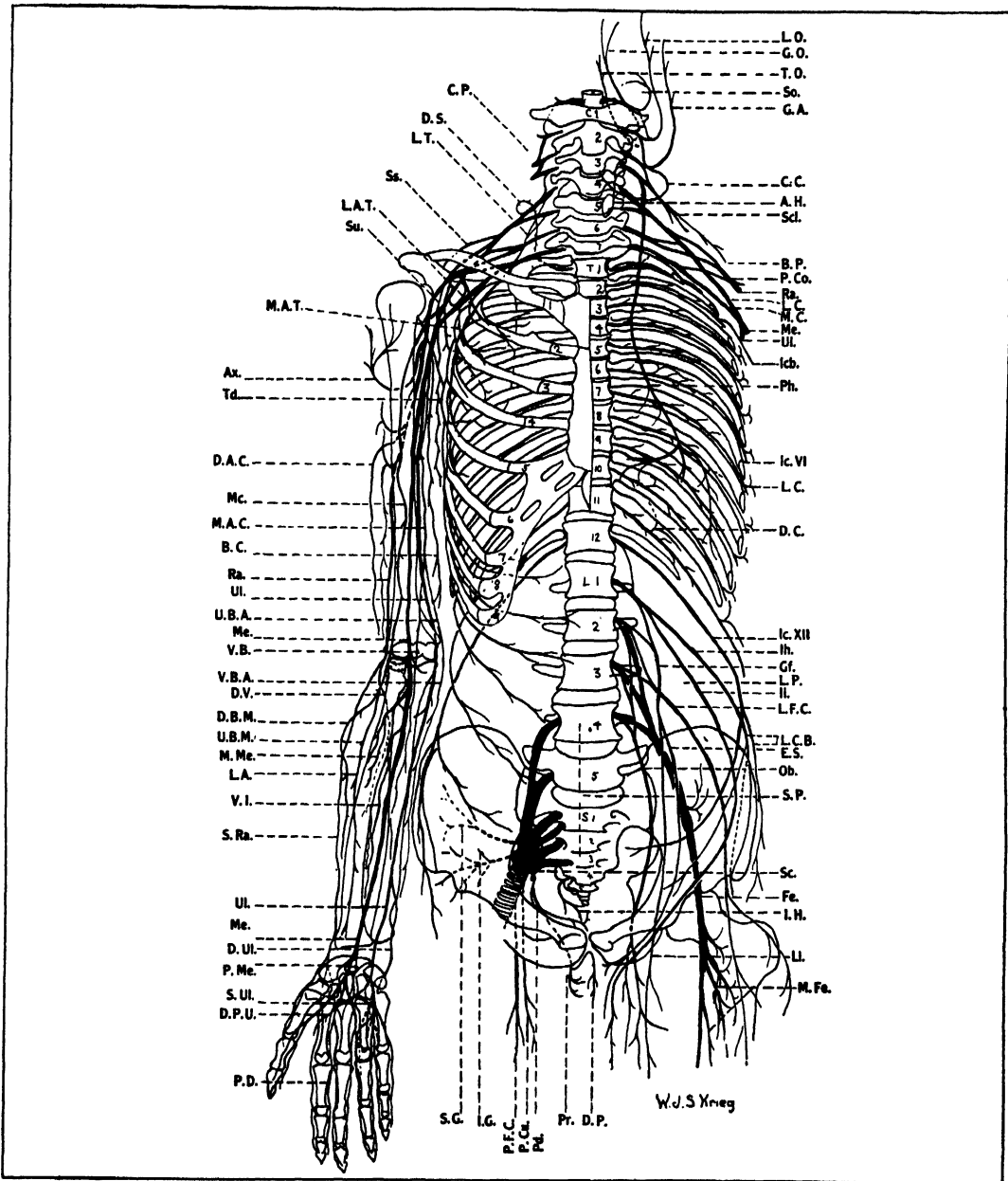
**NERVES**, bundles of living protoplasm within one body of an animal, which are specialized for the conduction of impulses. Nerves have connection with groups of nerve cells called ganglia, from which extend the protoplasmic prolongations forming the nerves. A nerve cell body within its ganglion and the protoplasmic prolongation together constitute a neuron. A single neuron may thus extend the greater part of the length of the body. (For anatomy of the neuron see **NERVOUS SYSTEM**).

Nerves may be sensory or motor in nature, though practically all contain both kinds of fibers. Accordingly, most nerves have two roots of origin; motor and sensory. Only sensory nerves have their cell bodies situated outside the central nervous system (brain and spinal cord) in separate ganglia. The bodies of motor cells lie within the **BRAIN STEM** or the **SPINAL CORD**. Motor nerve fibers terminate in close contact with muscle fibers, while sensory fibers terminate in connection with the receptors of the organs of the various senses. Both types are connected with other nerve cells within the central nervous system, and these in turn with others, so that an extremely complicated exchange system is formed.



NERVES OF THE INFERIOR EXTREMITY, SEEN FROM BEHIND, PROJECTED ONTO AN OUTLINE OF THE BONES

C.D., common digitals; C.M., to calf muscles; C.P., common peroneal; D.P., deep peroneal; Fe., femoral; G.&O., nerves to gemelli and obturator muscles; Gl., line of gluteal fold or fold of buttock; I.G., inferior gluteal; L.C., lateral femoral cutaneous; Li., lumbo-inginal; L.D., lateral dorsal cutaneous; L.P., lateral plantar; L.S., lateral sural cutaneous; M.P., medial plantar; M.S., medial sural cutaneous; M.Sa., branch of sciatic to adductors; Ob., obturator; P.A., peroneal anastomotic; P.C., posterior femoral cutaneous; P.D., proper digitals; Pd., pudendal branch of lateral femoral cutaneous; Sa., saphenous; Sc., sciatic; S.G., superior gluteal; S.P., superficial peroneal; Ti., tibial; V.L., to vastus lateralis; V.M., to vastus medialis



SPINAL NERVES OF THE HUMAN BODY PROJECTED ONTO AN OUTLINE OF THE SKELETON

A.H., ansa hypoglossi; Ax., axillary; B.P., brachial plexus; C.C., cervical cutaneous; C.P., cervical plexus; D.A.C., dorsal anti-brachial cutaneous; D.B.M., dorsal branch of musculocutaneous; D.C., dorsal cutaneous branch of eleventh intercostal; D.P., dorsal nerve of penis; D.S., dorsal scapular; D.P.U., deep palmar branch of ulnar; D.U.I., dorsal branch of ulnar; D.V., deep volar branch of radial; E.S., external spermatic; Fe., femoral; G.A., great auricular; Gl., geniofemoral; G.O., great occipital; Icb., intercostobrachial; Ic. VI., sixth intercostal; Ic. XII., twelfth intercostal; I.G., inferior gluteal; Ih., iliohypogastric; I.H., inferior hemirrhoidal; Li., ilioinguinal; L.A., lateral anti-brachial cutaneous; L.A.T., lateral anterior thoracic; L.C., lateral cord of brachial plexus; L.C.B., lateral cutaneous branches of iliohypogastric and of twelfth intercostal; L.F.C., lateral femoral cutaneous; Li., lumbosacral; L.O., lesser occipital; L.P., lumbar plexus; L.T., long thoracic; M.A.C., medial anti-brachial cutaneous; M.A.T., medial anterior thoracic; Mc., musculocutaneous; M.C., medial cord of brachial plexus; Me., median; M.Fe., muscular branches of femoral; M.Me., branches of median to muscles of front of forearm; Ob., obturator; P.Co., posterior cord of brachial plexus; P.Cu., perforating cutaneous; P.D., proper digitalis; P.Me., palmar branch of median; Pr., perineal; P.F.C., posterior femoral cutaneous; Pd., pudendal; Ph., phrenic; Ra., radial; S.C., sciatic; ScL., supraclavicular; S.G., superior gluteal; So., suboccipital; S.P., sacral plexus; S.Ra., superficial branch of radial; Ss., suprascapular; Td., thoracodorsal; T.O., third occipital; U.B.M., ulnar branch of median; V.B.A., volar branch of medial anti-brachial cutaneous; V.I., volar interosseus

Nerves whose roots of origin spring directly from the brain are cranial nerves (*see* BRAIN), while those arising from the spinal cord are spinal nerves. The twelve pairs of cranial nerves supply chiefly the head, though one, the vagus, goes as low as the intestine.

Corresponding to each vertebra (*see* SKELETON) there is a pair of spinal nerves. Each nerve has a motor root which arises from the front of the spinal cord and a sensory root which springs from the back of the cord. The union of these two constitutes the nerve. Close to the point of junction, the nerve divides into anterior and posterior branches. The posterior branch supplies the muscles of the back and mediates sensibility from the skin of the back. The anterior is the chief branch.

The nerves of the chest are the only spinal nerves that pass to their destination without considerable union or anastomosis with neighboring nerves. These nerves lie in the spaces between the ribs, supplying the muscles of the chest wall and the skin covering the chest and abdomen. (*See* accompanying figures.)

The upper four nerves of the neck send connections to one another, forming the cervical plexus. The nerves arising from this plexus supply the muscles of the neck.

The lower four nerves of the neck, together with the first nerve of the chest region, are quite large. They form a plexus under the shoulder-joint from which arise the nerves to the upper limb and shoulder region. Fourteen nerves arise from this, the brachial plexus. The three largest are the median, ulnar, and radial. Their course is indicated in the figure.

The nerves of the lower extremity separate out from another plexus, the lumbosacral plexus, which is contributed to by practically all of the nerves from the cord below the chest region. The two main nerves of the lower limb are the femoral and the sciatic. The former arises from the second to fourth lumbar nerves and supplies the muscles and skin of the front of the thigh. The latter is a product of a union of most of the fibers of the fourth and fifth lumbar and the upper three sacral nerves. It supplies most of the remainder of the lower limb.

The arrangement described is substantially the same in all animals higher than fishes. W. J. S. K.

**NERVES:** Cutting of. *See* NEUROSURGERY: Regeneration of Tissues.

**NERVO, AMADO** (1870-1919), Mexican poet, was born at Tepic, Aug. 27, 1870, and died in Montevideo on May 24, 1919, during his service as Minister of Mexico to Uruguay and Argentina. His inclination for poetry was exhibited by verses written as a child; he was destined for an ecclesiastical career, however, and though he broke away from this influence it appeared in his later poetry as a penetrating mysticism. Among the best known of his tales are *Pascual Aguilera, El donador de almas* and *El bachiller*, 1895; favorite collections of his poetry are those entitled *Perlas negras*, 1896; *Místicas*, 1895; *Lira heroica*, 1902; *Los jardines interiores* and *Sere-*

*nidad*, 1914. He is the author also of *Juana de Asbaje*, 1910, a much admired treatment of the life and personality of the great Mexican poetess, Sister Juana Ines of the Cross. Nervo's *Epitalamio* to Alfonso XIII heralded a definite turning-point in the history of the Modernist poetic renaissance. In 1910 Nervo's *Pajaro milagroso*, written after an airplane flight, sang visions of peace and obliterated boundaries. Among the younger Mexicans it is the early poetry rather than the hazy mysticism of Nervo's later years that is the more admired. I. G.

**NERVOUS SYSTEM.** All animals except the most lowly are composed of many CELLS. The nervous system developed in response to the desirability of keeping the cell groups of the body in communication with one another (sympathetic and autonomic nervous system), and of maintaining contact with the environment. The most rudimentary nervous systems consist of a net lying below the integument and composed of nerve fibers which are formed as outgrowths of specially differentiated cells of the outer layer which have secondarily become sunken below the surface. The origin of the nervous system from the layer of cells covering the body seems in keeping with its function of acting as mediator between the organism and the outside world. So fundamental and deeply ingrained is this origin, that the entire nervous system of even the highest animals has retained its ectodermal origin in the embryo.

In very early embryos, when the only differentiation discernible is a thickened line (primitive streak) on top of the hollow ball of cells formed by successive splittings of the fertilized egg, a longitudinal trough-like depression develops in line with the primitive streak (Fig. 1, *a*). This deepens (Fig. 1, *b*), and its sides grow together (Fig. 1, *c*), and finally fuse (Fig. 1, *d*), until in place of a trough there is now a tube. This is the neural tube. It marks the longitudinal axis of the future organism, and is to develop into the brain and spinal cord. As the tube closes, a few cells are left behind on either side all along its extent. These cells arrange themselves into definite groups and form spinal and cranial nerve ganglia. Some of the cells of this neural crest (*N.C.*) migrate ventrally and form other ganglia about the viscera. These are the sympathetic ganglia.

If we could observe these spinal or sympathetic ganglia under the microscope as the embryo develops, we should see that the rounded cells of which they are composed elongate, become fusiform, and finally develop two or more projections, depending upon whether we are observing a spinal ganglion or a sympathetic ganglion. In the case of the spinal ganglion one outgrowth grows towards the neural tube, and there divides into two branches at right angles to the original one. One of these branches is directed toward the brain end of the tube, and the other in the opposite direction. The other outgrowth of the cell grows in a direction opposite to that of the first process, into the developing tissues of the embryo. (Fig. 1, *E*, *F*). Some of these processes reach the

muscles and others attach themselves to the under part of the developing integument. As the embryo enlarges, these follow. The cells within the ganglion proliferate, forming new nerve fibers which follow

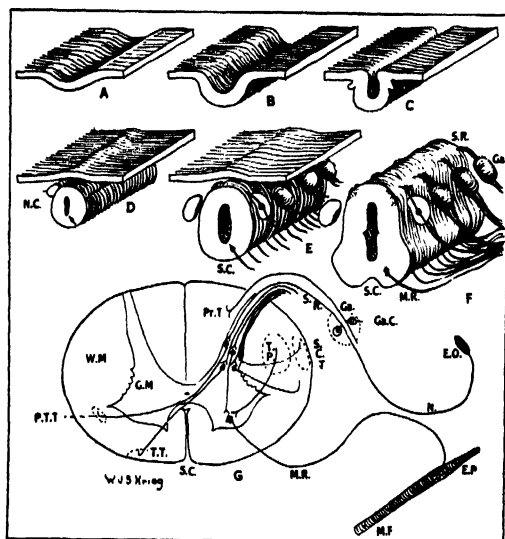


FIG. 1. DEVELOPMENT OF THE SPINAL CORD

A-F, stages in the development of the spinal cord

G, cross section of the spinal cord: E.O., end organ; E.P., motor end plate; Ga., spinal ganglion; Ga.C., ganglion cell; G.M., grey substance; M.F., muscle fiber; M.R., motor root; N., spinal nerve; N.C., neural crest; Pr.T., proprioceptive tract; P.T., pyramidal tract; P.T.T., pain and temperature tract; S.C., spinal cord; S.C.T., spinocerebellar tract; S.R., sensory root; T.T., tactile tract; W.M., white substance

the lines laid down by the earlier ones, but become attached to structures that develop later.

We now have the rudiments of the sensory part of the nervous system. The outgrowths between the ganglion cells and the body are the sensory fibers of the nerves, while those that grow to the tube and send branches to the brain become the sensory nerve roots.

At the same time these changes are taking place, the cells composing the walls of the neural tube are proliferating, so that the structure becomes many cells thick, and enlarges considerably (Fig. 1, e). It is soon evident that there are two types of cells here. Ependymal cells (*Ep.*) become attenuated and stretch from the outer to the inner wall of the tube. These are to bind together the nervous elements. The germinal cells (*Ge.*) form the nervous element. They remain within the neural tube and develop one long process which grows out of the outer wall of the tube and becomes attached to the developing muscles which lie close to the side of the neural tube. These are motor nerves (Fig. 1, g).

In a similar manner, though somewhat later, processes grow down the outside of the ventral and lateral surfaces of the neural tube, now the spinal cord. These processes come into contact with the motor nerve cells, which secondarily develop several small

processes to receive them. Other nerve fibers connect the different parts of the cord with one another, and different parts of the brain with one another, so that a complex network obtains within the central nervous system (BRAIN AND SPINAL CORD). These are intermediate neurons.

We now have the elements of the functioning nervous system (Fig. 1, g). Impulses from the exterior are received by the end organ (*E.O.*) and carried through the sensory fibers of a spinal nerve (*N.*) to the ganglion cell (*Ga.C.*) within the spinal ganglion (*Ga.*). These impulses continue through the other process, the sensory root (*S.R.*), into the spinal cord and ascend to the brain.

Not all sensory fibers, however, carry the same kind of sensations. Those carrying sensations of touch from all the spinal nerves of one side become combined in a single bundle contained in the spinal cord but on the opposite side (*T.T.*). Sensations of pain and temperature gather in another tract close by the one just mentioned (*P.T.T.*). Nor are these the only types of sensation, for the muscles are constantly sending impulses which convey to brain in just what state of contraction they may be; and the joints, tendons and deeper tissues in general are constantly conveying impulses which, when sorted and analysed in the brain, tell in what position any member of the body may be. The unconscious sensations from the muscles accumulate in a tract on the same or opposite side of the cord and pass to the cerebellum (*S.C.T.*). The other proprioceptive sensations accumulate at the back of the spinal cord and pass to the thalamus and the cortex of the cerebrum (*Pr.T.*).

These sensations are the raw material for thought, reactions, and motion. They are analyzed by the tremendously complex switchboard of the brain, and the final results of the reflexes and thought processes produced are carried down the spinal cord again by other descending tracts, like the pyramidal tract (*P.T.*), which comes from the motor cortex. These impulses act on the motor cells, and the impulses induced are carried out by the motor root and motor nerve to the muscles. The result is motion, locomotion, speech, and the like.

Of course, not all the sensations reach the brain. Some pass almost directly to motor cells of the same and opposite sides, and at the same or different levels of the cord, through the intervention of the short intermediate nerve fibers within the cord. (Fig. 1, g, *I.N.*). Such unconscious short circuits are called reflexes.

The outer portion of the cord, composed of longitudinally directed nerve fibers, is the white matter (*W.M.*). The inner portion, composed of nerve cells and a few fibers, is the grey matter (*G.M.*). In the spinal cord it is shaped like the letter H or the letter X. In the brain it is variously distributed, but forms the cortex of cerebrum and cerebellum.

As is evident from the foregoing, each nerve fiber is an outgrowth of a nerve cell. A nerve is a number

of fibers lying side by side in the midst of non-nervous tissues. A ganglion is a collection of nerve cells surrounded by non-nervous tissues. A nerve cell with its fibers is a neuron (Fig. 2). The fibers that conduct impulses to the enlarged portion of the nerve cell (perikaryon, *Pk.*) are dendrites (*De.*), while the

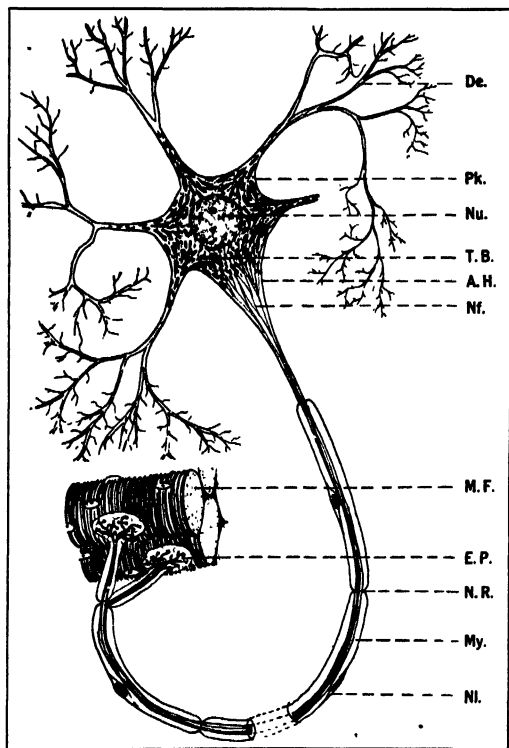


FIG. 2. PARTS OF A MOTOR NEURON

A.H., axon hillock; De., dendrite; E.P., motor end plate; M.F., muscle fibers; My., myelin sheath; Nf., neurofibrils; Ni., neurilemma; N.R., node of Ranvier; Nu., nucleolus; Pk., perikaryon; T.B., tigroid bodies

one that conducts impulses away from the nerve cell is the axon (*Ax.*). Nerve fibers that conduct any considerable distance are usually insulated from neighboring ones. This is effected by surrounding the fiber with a tube of a fatty compound containing phosphorus, and called myelin (*My.*). This is in turn surrounded, in the nerves, by sheathing cells, the neurilemma (*Ni.*). The perikaryon contains minute triangular or flecklike granules of a substance which stains intensely with methylene blue. These are called Nissl or tigroid bodies (*T.B.*). They are more conspicuous in motor neurons than in sensory ones. Silver nitrate stains exhibit fine fibrils running through fibers and perikarya. These are thought by some to be the actual carriers of the nerve impulse and are termed neurofibrils (*Nf.*). In various situations of the nervous system the component neurons assume widely varying forms which are fairly characteristic of their situation and connections.

The peripheral ends of nerves are modified to en-

able them to pick up sensations more efficiently or to place them in closer contact with their effectors. Some nerves end by dividing freely in the tissues, others have small terminal knobs, and others are intimately surrounded with more or less extraneous tissue. In general, the various types of nerve endings are correlated with certain types of sensations and specific types of effectors.

If the brain and spinal cord were composed entirely of nerve cells and their processes, the structures would be almost fluid. Accordingly, they are bound together by non-nervous elements. These cells, neuroglia cells, assume one of several forms. The origin of all types except one can be traced back to the ependymal cells of the neural tube. They are mossy masses of fibers radiating from a central cell body. By their overgrowth they cause brain and spinal cord tumors. See also BRAIN; SYMPATHETIC NERVOUS SYSTEM; SPINAL CORD; NERVE. W. J. S. K.

**NERVOUS SYSTEM, SURGERY OF.** See NEUROSURGERY.

**NESPELIM**, a North American Indian tribe speaking the Okinagan dialect of the Salish linguistic stock and living formerly on a northern tributary of the Columbia River, about 40 mi. above Ft. Okinagane, Wash. They now live on the Colville Reservation in Washington.

**NESSUS**, in classical mythology, a centaur who carried travelers over the River Evenus. One day, carrying over DEINAIRA, wife of HERCULES, he did violence to her, and was shot by one of Hercules's poisoned arrows. In revenge, as he was dying he told Deinaira to make a love charm for her husband by dipping Hercules's coat in his ebbing blood. The result was the tragic end of the hero's life.

**NEST**, the receptacle built by birds to receive their eggs, or other spots definitely prepared by animals for newborn young. While the function of NIDIFICATION is most commonly ascribed to birds, certain mammals, reptiles, fishes and invertebrates so prepare the surroundings for their young that these may properly be called nests. Crocodiles dig holes in the sand, lay their eggs there and sleep over the nests; the alligator builds a mound of earth and decaying vegetation to receive her eggs. Among fish, the sticklebacks build nests of weeds, the male fish guarding the eggs; sunfish scoop rude nests in sandy banks. Some frogs lay their eggs in leaves made funnel-shaped by a gelatinous secretion. Wasps, bees, and ants build elaborate structures which serve both as nurseries and community dwelling places. The harvest mouse constructs among cornstalks a nest like a bird's; rabbits choose burrows, lining their nests with fur.

Infinite variety marks the nests of birds. Some, as the flamingo, give their young only the scant protection of a mound or hollow in the ground. A loose structure of reeds and brush among the marsh growth suffices for the bittern or crane. Such birds usually belong to the precocial type, like chickens, the young run about upon hatching. Where the young are help-

less after hatching, the nest is more elaborate and skilfully hidden. Such nests are built of twigs, leaves, horsehair, reeds, moss, down, mud or clay, and such natural materials, woven or packed together. They usually hang in trees or bushes, although the thrush nests on the ground and the eagle often on a mountain ledge. One of the strangest nests is that of the swift, which uses saliva to construct nests favored in China for soup. Most delicately beautiful are those of humming birds; most remarkable the hanging nests of orioles.

**NESTOR**, in Greek mythology, son of Neleus, King of Pylos, was noted for his wisdom and persuasive oratory. He fought the Eleans, Arcadians and CENTAURS and in his old age joined the expedition against Troy.

**NESTORIANS**, a Christian sect deriving its name from Nestorius (fl. 431), a patriarch of Constantinople, who was a disciple of Theodore of Mopsuestia. Nestorius maintained that there were two persons in Jesus Christ, and placed strong insistence on his human nature. He denied that Mary could be called the Mother of God, *Theotokos*, since only the human nature was born of her. The doctrine advocated by Nestorius was condemned and anathematized by the ecumenical councils of Ephesus, 331, and Chalcedon, 451. Due to the missionary zeal of its followers, Nestorianism was carried far and wide throughout the East and Near East. The Nestorian Church reached its greatest influence in the 13th century, when it comprised the powerful body of Christians in the world; but thereafter its influence steadily declined. The modern Nestorians, or East Syrians, inhabit Turkey and Persia. They regard Nestorius as a saint, and invoke his name for aid.

**NESTORIUS** (? -439?), Heresiarch and patriarch of Constantinople, the date and place of whose birth and death are not known with any certainty to-day, is chiefly remembered as the founder of Nestorian Christianity. He was patriarch for about four years (428-431) when he was deprived of his authority by the Council of Ephesus on account of his heretical doctrines. He denied the hypostatic union of two natures in the one person of Christ, holding that Mary was the mother only of the human nature in Christ—mother, therefore, of Christ the human being, but not of Christ the second person of the Trinity. For about a thousand years his followers were very numerous throughout the East, especially in India and Persia. The Emperor Tai-tsung of China (627), whose empire reached to the Caspian Sea, received Nestorian missionaries from Persia and ordered the Scriptures translated into Chinese. In the 16th century large numbers of Nestorians joined the Roman communion, but there is still a remnant in the East. Nestorius died between 439 and 451.

**NETHERLANDS, THE**, a kingdom on the northwest coast of central Europe, commonly known as Holland, lying between 50° 46' and 53° 33' N. lat. and 3° 22' and 7° 13' E. long. and bounded by Belgium on the south, Germany on the east, and

by the North Sea on the west and north. The total area is 13,210 sq. mi., including inland waters.

**Surface Features.** Much of the country consists of deltaic deposits. Three great rivers, the RHINE, the Maas and the Scheldt, had deposited their slime for ages among the dunes and sand banks heaved up by the ocean around their mouths. Human energy has materially supplemented the operations of natural forces by draining the marshes and trenching the fens, by fighting against the drifting sand, protecting the coasts with dunes and dykes, and regulating the rivers. Hence polders, i.e., enclosures surrounded by dykes or embankments and provided with pumping machinery, form the characteristic scenery of the most populous parts of the country. About 38% of the total surface area would be inundated by the ocean were it not protected by dunes and dykes. The remaining 62% of the surface on the whole forms a series of zones stretching from southwest to northeast. There are hills of gravel and sand ranging from 150 to 300 ft. in elevation, and in the southeast the highest elevation of the kingdom attains an altitude of 1,055 ft.

**Relief and Climate.** There is so little variety of relief that there are about 4,800 mi. of navigable rivers and canals; and the small size and the uniformly low level minimize climatic variations. Marked differences of physical structure and distinct seasonal changes of climate give rise to some variety of landscape and considerable localization of natural and cultivated vegetation. For instance, the most effective medium of precipitation is the line of sandhills, while the lowest levels of the whole country are found to leeward of them in the polders; on the other hand, conditions tend less toward heavy rainfall, which scarcely exceeds 28 in., than to high humidity, which is associated with constant mist in the more dusty parts of the country. Wide exposure gives great extremes of temperature, and heavier rainfall. The average temperature, 50° F., is essentially temperate, southwest winds raising the temperature for nine months, and northwest lowering it for three months.

**Population.** On May 1, 1931, the total population was 7,938,114.

The great majority of the inhabitants are Dutch or, more properly, Netherlanders, descendants of the old Teutonic Batavians. Chiefly settled in the provinces of North and South Holland, Zeeland, Utrecht and Gelderland, they formed 71% of the 1926 population; another 14% are Frisians. About 1% of the population live on barges. THE HAGUE, seat of the Court, had a population in 1930 of 443,357; AMSTERDAM, the legislative capital, had 759,286; ROTTERDAM, 586,285; UTRECHT, 154,957.

**Religion and Education.** Religious liberty is granted to all subjects, and the State makes financial allowances to every church. Three-fifths of the people are Protestants, and the remainder are chiefly Roman Catholics. Of Jews, mainly descendants of Spanish refugees from the persecutions of PHILIP II, there are about 100,000, of whom 40,000 live in Amsterdam.

The State, the province and the commune all bear part in the support of schools. Primary education is obligatory. There are ancient universities at LEYDEN, Amsterdam, Utrecht and Groningen.

**Agriculture.** The level land facilitates agriculture in many ways. One is that the soil is deep and little subject to erosion or leaching. Artificial fertilization has helped to make the better soils remarkably productive. The chief crops are oats, barley, wheat, rye and potatoes. Much grass is grown on the polder or black lands in the southwest, below or only a little above high tide. Dairying is carried on extensively. Many tulips are grown in the narrow sandy belt between the coast and the black lands. The total value of agricultural products in 1929 was estimated at \$500,000,000.

**Horticulture.** The horticulture of the western part of the kingdom stands by itself, but it is significant that the typical products are all of a bulbous kind and humble habit. The dunes supply the necessary sand, the pure water and the protection from salt-bearing winds, which are the essential needs of the black peaty soil for the production of spring flowers. HAARLEM is the most famous center because it is far enough north to feel the climatic benefit of the ZUIDER ZEE, and because it possesses an ideal site in other respects in the 70 sq. mi. of the drained floor of its old lake.

**Fisheries.** There are about 5,000 ships engaged in fishing, and they catch about 500,000,000 lbs. of fish a year. The islanders, Frisians and Zeelanders, are more interested in the inshore fisheries, the flatfish and sardines of the Zuider Zee and the Wadden, or the oysters and mussels of the Scheldt. All the deep-sea fisheries are worked from Holland proper, IJmuiden being the great center.

**Coal.** During the World War, when the Netherlands found it extremely difficult to import coal, a great effort was made to locate coal under the delta deposits close to Germany and Belgium. Unexpected success came and now the annual output is about 11,000,000 tons, and is increasing rapidly. The reserve is officially estimated at 5,000,000,000 tons.

**Manufactures.** Because nearly all of the country is delta land and until recently had no mineral output aside from potter's clay, the manufacturing industries developed were those which required little fuel but considerable skill, such as diamond cutting, the manufacture of fancy cotton goods, artistic pottery and good cheese and butter. Accompanying the recent development of coal mining has been a great increase in manufacturing. Textiles are especially important, but an interesting item is 300,000 bicycles a year. Another leading product is margarine made from imported vegetable oils and mixed with butter. In a recent year about 400,000,000 lbs. were manufactured in addition to 190,000,000 lbs. of butter and 285,000,000 lbs. of cheese.

**Transportation and Trade.** Barge transport naturally results from Holland's situation as a great ocean gate for the water-borne traffic of central

Europe. Among the sea isles of Zeeland the canals connect inland towns with ports; in Holland proper they connect river ports with the sea, as Rotterdam is connected with the North Sea by the New Waterway, and Amsterdam by the North Sea Ship Canal. Away from the sea and the great rivers, they are themselves the main arteries of traffic; in the drier parts of the country they are even used for irrigation.

The distribution of towns and industries, and the character of both, largely reflect certain geographical conditions. For instance, though the polders raise a good type of horse in Friesland, their value is specially for cattle; and dairy industries are specially suited to Holland, which has important colonies to attract the male population into commerce. The success of the dairy products in the Netherlands is largely due to the care with which quality is guaranteed by control stations in all parts: Leiden and Goe, Eindhoven and Maastricht, Deventer and Assen, Groningen and Leeuwarden. Slightly easier access to salt and slightly lower changes of temperature make cheese rather more important than butter west of the Zuider Zee, so that ALKMAAR is the great cheese market, while GRONINGEN is the great butter market. Again, rye is the typical grain, being most important in the more continental climate of Gelderland. It is the base of the food and drink of the people, the bread being made mainly of rye mixed with wheat. Both "Hollands" gin of Schiedam and the curaçao liqueur of Rotterdam have a rye base. A large amount of alcohol is also made from potatoes and sugar beet, and the country is one of the chief refiners of beet sugar, Rotterdam and Amsterdam being the 2 great centers. The associated vinegar industry is supplied with onions, gherkins and cauliflowers, for pickling, from the market gardens between Alkmaar and Hoorn. The typical "colonial" industries in tobacco and chocolate, quinine and diamonds are in or near Amsterdam.

The Netherlands has been one of the important nations of the world since the 16th century when the Dutch became distributors of oriental merchandise brought by the Portuguese to Lisboa, or Lisbon. Soon they undertook trips round Africa in order to get the oriental products themselves. The development of this early commerce afforded the basis of Dutch commercial importance and helped them secure choice colonies in various parts of the world, especially in the East Indies (*see DUTCH EAST INDIES*). Three-fourths of the total export from the colonies goes to the Netherlands. Only about one-fifteenth of the country's total commerce, however, is with her colonies. More than one-half of it is with its four nearest neighbors. The United States, the other important nation in the foreign trade, furnishes about 11% of the imports but receives only 7% of the exports, including about \$25,000,000 worth of diamonds. The chief imports are textile fibers, cereals, iron, steel, coal and mineral oil. The exports are textiles, butter, cheese, milk, fresh meat, garden products, margarine and paper.





## NETHERLANDS

Area...13,202 sq. m.  
Pop.....7,832,178

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

782 Amsterdam

114 Apeldoorn...G 19

78 Arnhem...H 19

45 Breda...H 18

51 Delft...H 11

36 Deventer...G 20

96 Dordrecht...H 13

95 Eindhoven...J 16

41 Emmen...D 24

53 Enschede...G 23

Flushing, see Vlissingen.

105 Groningen

119 Haarlem...P 12

47 Heerlen...J 19

34 Hengelo...G 23

57 Hilversum...G 15

37 Kerkrade...L 19

48 Leeuwarden

71 Leiden...G 12

61 Maastricht

M 18

582 Rotterdam

H 12

53 Schiedam...H 12

437 s'Gravenhage

H 11

42 s'Hertogenbosch...I 16

The Hague, see s'Gravenhage.

78 Tilburg...J 15

154 Utrecht...H 16

41 Velsen...F 13

41 Zwolle...F 20

## BELGIUM

Area...11,780 sq. m.  
Pop.....8,128,405

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

284 Antvers

(Antwerp)

K 11

41 Berchem...K 12

54 Borgerhout...K 12

51 Bruges...K 6

200 Bruxelles

(Brussels) M 12

28 Charleroi...N 12

39 Courtrai...M 6

170 Gand...L 9

16 Genbrugge...L 9

25 Gilly...N 12

33 Hoboken...R 8

30 Jumet...N 12

32 Laeken...L 11

24 La Louviere

N 11

166 Liege...M 17

28 Lierre...K 12

40 Louvain...M 13

60 Malines...L 12

27 Merxem...K 12

32 Mouscron...M 6

30 Namur...N 13

44 Ostend...K 4

38 St. Nicolaes...K 11

119 Schaerbeek

M 12

45 Seraing...N 17

36 Tournai...N 7

43 Uccle...M 11

41 Verviers...N 18

Veurne, see Furnes.

## LUXEMBOURG

Area...998 sq. m.  
Pop.....300,748

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

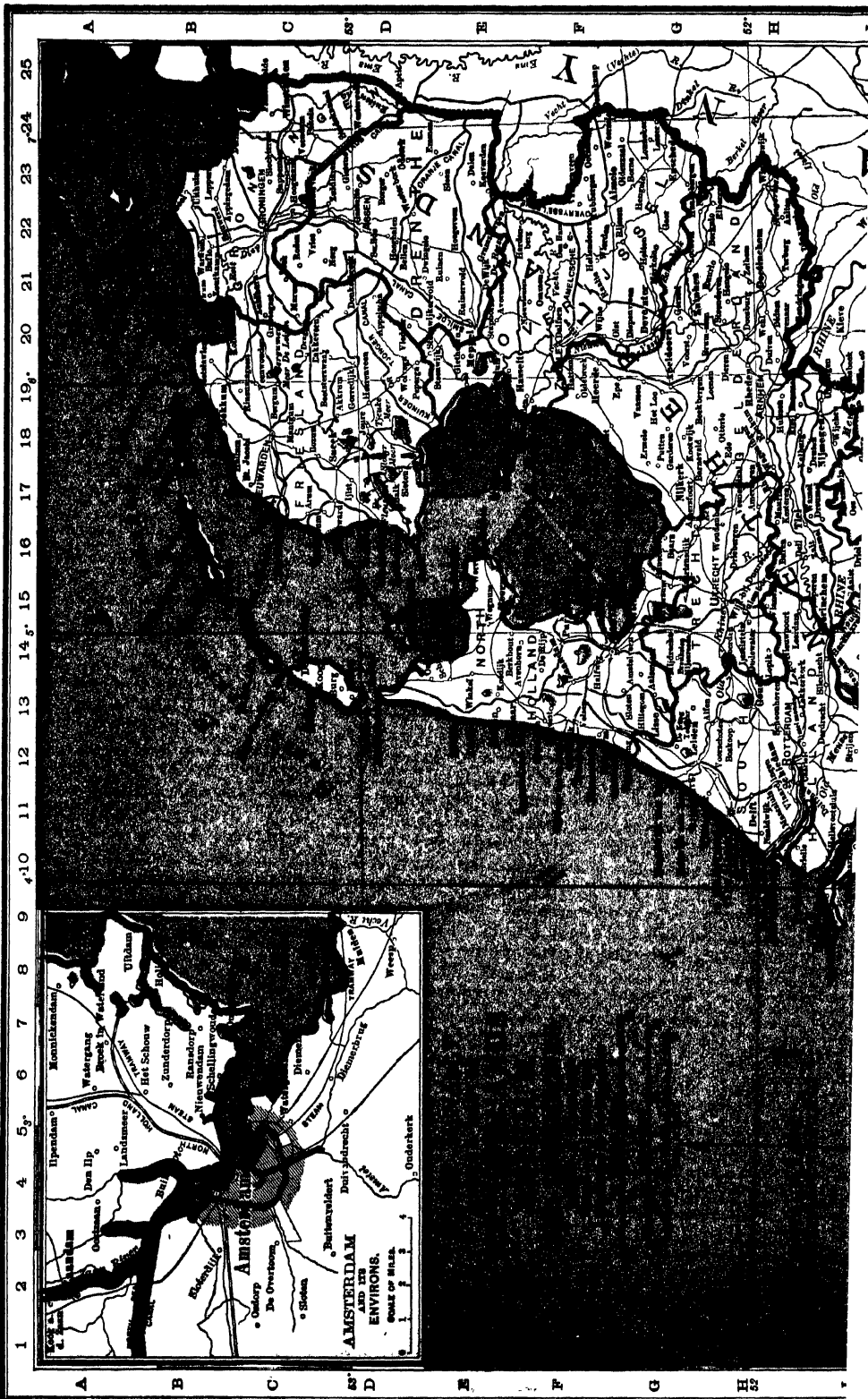
4 Diekirch...Q 21

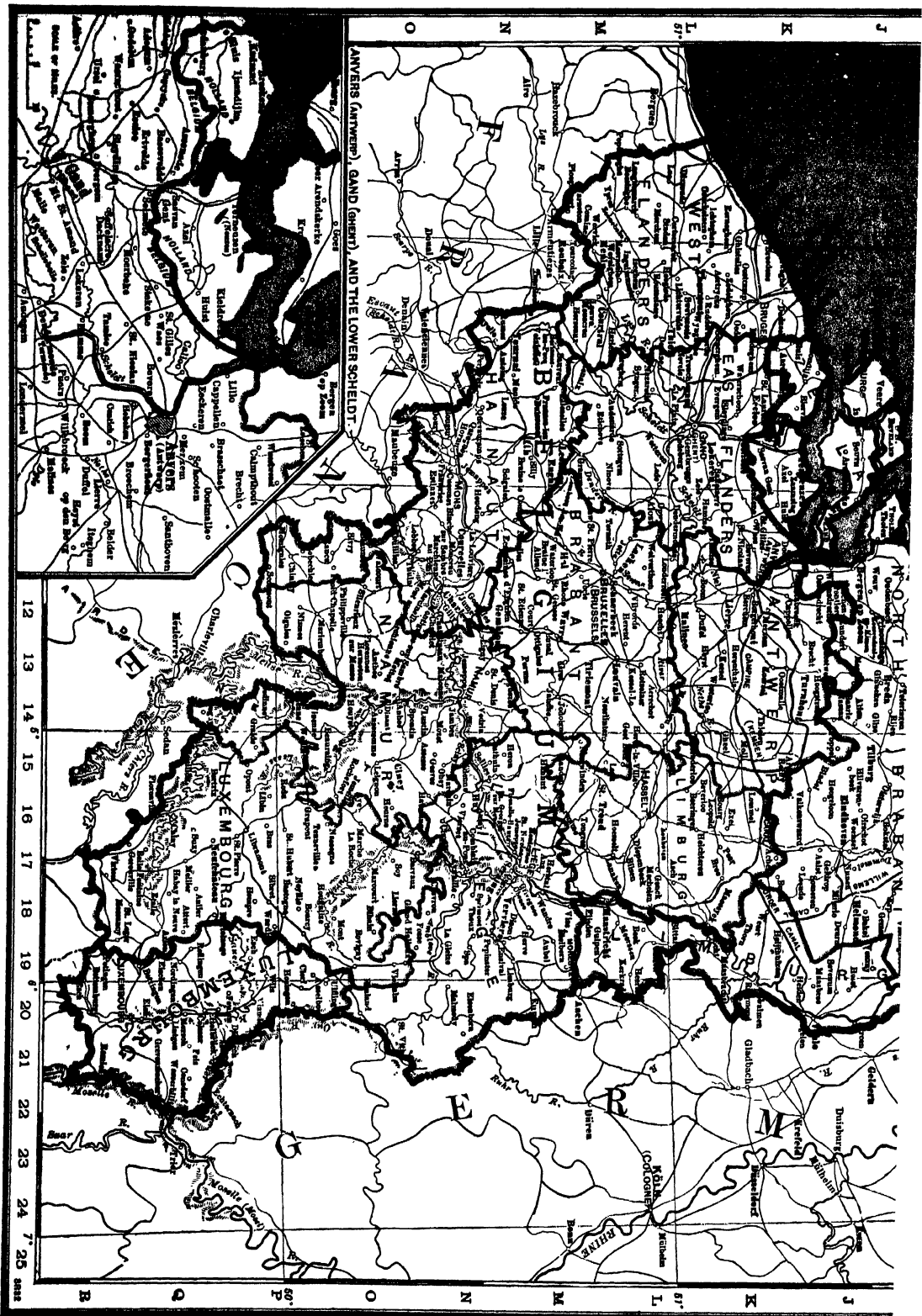
29 Esch...P 19

4 Ettelbruck...Q 20

54 Luxembourg

K 20







**Finance.** The guilder, or florin, is the monetary unit, par 40.2 cents. The Netherlands Bank has been granted the monopoly of the issue of bank notes. The budget estimate for 1931 was: revenue, 657,306,000 guilders; expenditure, 707,900,000 guilders.

**Government.** The form of government is a hereditary limited monarchy. The legislative power is exercised jointly by the king and a parliament of two chambers. The upper chamber consists of 50 members elected for six years by the Provincial States, the representative bodies of the 11 provinces. The 100 members of the lower chamber are elected by direct suffrage of four years. The supreme tribunal, at the Hague, is the highest court. All judges are appointed by the king for life. Trial by jury is unknown.

**NETHERLANDS, HISTORY OF THE.** The low, sandy and marshy country at the mouths of the Rhine and Meuse was annexed to the Roman Empire by Caesar in 57 B.C. Later the frontier was pushed temporarily to the Ems River, but there was never any serious Roman occupation beyond the Rhine. At that time the country was thinly inhabited by Celtic tribes who appear to have become completely Romanized. At the collapse of the Empire, however, they were almost completely replaced by German-speaking Franks who occupied all the district south and west of the Rhine, while the Frisians and their allies, the Saxons, held the northern coast. The Franks were Christianized by 500, but it was not until 700 that the Frisians, and 800 that the Saxons became converted.

At the division of the Frankish Empire among the grandsons of Charlemagne, the Netherlands (except to the west of the Scheldt) were assigned along with Italy to Lothair, but with the extinction of Lothair's line they were attached to the East Frankish dominions and became an integral part of the Holy Roman Empire, divided by the Rhine into the Duchies of Friesland and Lower Lorraine. During the 10th century the country was ravaged by the Northmen, but gradually it recovered and made progress in agriculture and industry. It underwent the feudal process of territorial subdivision, the counties of Holland, Zeeland, and Gelderland being cut out of Friesland, and Lower Lorraine being divided into the Duchies of Brabant and Luxemburg. Gradually the wool trade grew, chiefly in the southern provinces, modern Belgium, and in the north the work of reclaiming lands from the sea was started. By a long policy of wars and marriages, Charles the Bold, Duke of Burgundy, became master over a great block of territory stretching from the Alps to the North Sea including most of modern Holland. With his death in 1477, the western portions of his domains fell to France. The Netherlands, modern Belgium and Holland, were retained by his only daughter, Mary, and passed to the Habsburg House on her marriage to the Emperor Maximilian I. The marriage of their son Philip to Joanna, daughter of Ferdinand and Isabella of Spain, brought to Charles V, their grandson, the inheritance

of Spain, America, Austria, The Netherlands and the Empire. On his abdication Charles left all of his Habsburg inheritance except The Netherlands, to his brother Ferdinand, these with Spain he ceded to his son Philip II, so that, although the Netherlands were still officially within the shadowy Holy Roman Empire, they were directly subject to the crown of Spain.

**Growing Opposition to Catholicism.** Philip departed from The Netherlands in 1559, appointing as regent his natural half-sister, Margaret of Parma, to rule with the advice of Cardinal Granvelle. The situation was tense. Protestantism had not yet crossed the Ems, but there was already a sprinkling of Calvinists and Lutherans throughout all the Low Countries. Further opposition to Spain came from the oligarchies of the great commercial towns, and in general all the inhabitants, of whatever political or religious faith, objected to the presence of Spanish troops. In the hope of easing the situation Margaret on her own authority sent away the troops in 1561, but two years later Philip's determination to enforce the decisions of the Council of Trent revived the bitterness. The attempts of the great nobles, William the Silent of Nassau and prince of Orange, and the Counts Egmont and Hoorn, to obtain some mitigation of the religious persecution were finally refused by Philip. But as arrests, imprisonments and executions for heresy increased, the more Calvinism grew and the more bitter it became, spreading out into secret conspiracies and open desecration and destruction of churches. Egmont and Hoorn still wished to compromise, but in Apr. 1567 Orange withdrew from Brussels into the safety of Protestant Nassau beyond the Rhine.

Four months later the Duke of Alva arrived with picked Spanish troops and a blanket commission from Philip to stamp out Protestantism and to subdue the Netherlands. Margaret resigned and the war became open and bitter on both sides. At first Alva carried everything before him. The country was overrun, Egmont and Hoorn were beheaded, and the suppression of Protestantism was carried on with redoubled vigor. Orange became a Lutheran, went to France and from there issued letters of marque to privateers to harry Spanish shipping along the Dutch coast. These privateers, known as Sea Beggars, became numerous and in the spring of 1572 risked a land attack, capturing Brill at the mouth of the Meuse. The seizure of Flushing and Delfthaven soon followed and thereby the mouths of the Meuse and Scheldt were closed to the Spanish. Thus protected, the provinces of Holland, Zeeland, Gelderland, and Friesland rose and drove out the Spanish. Alva advanced against them and captured Zutphen and Naarden and began the long sieges of Haarlem and Leyden. At last the Dutch fleet defeated Alva's ships on the Zuider Zee and in Dec. 1573, Alva withdrew in despair and resigned. Philip replaced him with Requesens who accomplished little. Just at this time the "Spanish Fury," the sack of Antwerp, 1576, horrified all the Netherlands and they signed among themselves the Pacification of Ghent by which they united

to fight their persecutors. Don John, sent by Philip as the new governor, found himself unable to do anything but accept the Pacification. Slowly, however, the Southern Provinces drew apart and in Jan. 1579, formed the League of Arras, and decided to make peace with Spain. The more Protestant North refused to join in such a move. By the Union of Utrecht they leagued together, 1579, and the war recommenced. Don John died and Philip sent Alexander Farnese, Duke of Parma, the able son of the former viceroy Margaret to govern his recalcitrant provinces. Orange maintained himself in Holland and Zeeland until he was assassinated by a Catholic, July 10, 1584. Maurice of Nassau, his second son, a minor, was elected stadtholder, or executive, of Holland and Zeeland in Orange's place but the government was carried on by the able Barneveldt, Pensionary (delegate to the Estates General) of Rotterdam, who successfully resisted Parma. The plans for the Spanish Armada enormously aided the Dutch and with the splendid military ability which Maurice soon exhibited, they advanced southward. In 1592 Parma died, to be replaced by the mild Archduke Albert of Austria with the military command in the hands of Spinola. The war drifted on indecisively until at length in 1609 a 12-year truce was agreed upon.

With peace, internal difficulties at once broke out in the United Netherlands, ostensibly over theological matters, but in fact over whether the Orange house should become a ruling dynasty or the government rest in the hands of the merchant oligarchy. Maurice suppressed the oligarchic party, executing Barneveldt. In 1621 the war broke out again and four years later Maurice died, to be succeeded as stadtholder in the various provinces by his brother, Frederick Henry, who in 1631 succeeded in making these offices hereditary in his family. Frederick Henry died in 1647, but his work of securing The Netherlands a strategic frontier against the Spanish had been accomplished and in the Treaty of Münster, June, 1648, their complete independence from Spain and the Empire alike was formally recognized.

**Rule by Oligarchy.** During the preceding 80 odd years the government was officially vested in an Estates General representing the individual provinces, each of which was ruled by its own oligarchy. The pressure of war, however, had made the Orange princes practically kings. With peace the oligarchy again reasserted itself. William II of the House of Orange, who had succeeded his father, Frederick Henry, shortly before 1648, proved an able politician and was apparently on the verge of turning the stadtholdership into an hereditary kingship when he died suddenly of smallpox in Oct. 1650. His posthumous son, William III of Orange was immediately set aside, the stadtholdership was declared vacant and the oligarchy of Amsterdam took control of the government. The leader was now John De Witt, Grand Pensionary of Holland. De Witt allowed the army to decay since it was always of royalist sympathies and because it seemed too expensive to the Amsterdam

business men. The navy was maintained, however, and two bitter and generally successful naval wars were fought with England, 1652-54 and 1664-67. In 1672 the first of the wars of Louis XIV burst upon the Republic. With England allied with France The Netherlands were desperately exposed. William III was immediately elected stadtholder and De Witt killed by the mob. The English and French invaded the country, but a separate peace with England in 1674 and the intervention of other powers left The Netherlands boundaries unchanged. Later William III married Mary, daughter of James I of England, and in 1688 they were placed on the English throne. When William died childless in 1702, the government of The Netherlands returned to the hands of the oligarchy. Thereafter the Low Countries scarcely counted as a military power in Europe. The transfer of the Belgian provinces from Spain to Austria in 1713 and the Republic's privilege of garrisoning the barrier towns on the French frontier left the country relatively free, or at least protected from powerful enemies. The Dutch took little part in the wars of the 18th century, Dutch energy finding an outlet in foreign trade and internal political disputes. In 1793, however, The Netherlands, anxious over the conquest of the Austrian Netherlands and the opening of the Scheldt by the French, joined the coalition against the French Republic. Two years later during the winter of 1794-95 Holland was itself invaded by a French army under Pichegru. The stadtholder fled to England and the French annexed Dutch Flanders and organized the rest of the United Netherlands into the Batavian Republic. In 1806 Napoleon's brother Louis was established as King of Holland. He refused to cooperate with the French in the application of the continental blockade and was forced to resign in 1810. The country was then incorporated into the French Empire and so remained until Napoleon's downfall. When the tide began to turn against the illustrious general, the Dutch joined the Allies in their attack upon him. William of Nassau, the heir of the Orange line, was called in to head the government. At the Congress of Vienna the Northern Netherlands were joined with the Southern Provinces, now modern Belgium, and the Duchy of Luxemburg to form the Kingdom of the United Netherlands, but it was necessary to surrender to the British the Dutch colonies of South Africa, Ceylon, and a part of Guiana.

**Secession of Belgium.** The union of Holland and Belgium was unfortunate, and in 1830 Belgium revolted and declared its independence (*see* BELGIUM). In 1840 William I abdicated, to be succeeded by his son William II whose short reign of nine years was noteworthy for the adoption of a new constitution which considerably increased parliamentary government and extended the franchise. William III succeeded his father and continued his father's policy; he widened the franchise further and upon his death in 1890 was followed by his only daughter, Wilhelmina. During the World War the neutrality of Holland was re-

spected by both sides, but the British blockade was extended against her to prevent supplies from reaching Germany and imports were admitted only under the most rigid control. After the War Belgium urged the powers to force Holland to cede Limburg and the left bank of the Scheldt to her, but this was not done. The two most noteworthy post-war events have been political difficulties in the Dutch East Indies and the inauguration of a gigantic 30-year project for raising and reclaiming the Zuider Zee, adding an entirely new province to the country.

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**NETTLE**, a name applied to a genus (*Urtica*) of herbs of the nettle family usually covered with stinging hairs. There are about 30 species widely distributed in temperate regions of which nine are found in the United States. They are usually erect plants with opposite toothed leaves and small greenish flowers. Among the species widely distributed in the United States and Canada are the tall nettle (*U. gracilis*), sometimes 7 ft. high, the stinging nettle (*U. dioica*), densely clad with stinging hairs, and the small nettle (*U. urens*). Various other plants of the same family armed with more or less stinging hairs are also known as nettle. Certain nettles yield dyestuffs, others textile fibers and Indian species produce tubers used for food.

**NETTLE-TREE**, a name sometimes given in the eastern and southern States to the HACKBERRY, a large tree of the elm family with somewhat nettle-like leaves.

**NEUCHÂTEL**, a city of Switzerland, capital of the canton of the same name, on the Lake of Neuchâtel. It is a pleasant, well-built city, rising in terraces from the handsome quai to the 12th-century castle, now seat of the cantonal government. The Collegiate Church in pure Romanesque style, surrounded by promenades with fine views, the university and the Musée des Beaux-Arts are noteworthy. The chief industries are the manufacture of watches, jewelry and electric apparatus. Pop. 1930, 22,775.

**NEUCHÂTEL**, a large lake of western Switzerland, bordering on the eastern range of the Jura Mountains, 20 mi. north of Lake Geneva. It includes Lakes Bienné and Morat, joined to it by canals. In prehistoric times lake-dwellers inhabited this region. Lake Neuchâtel lies more than 1,400 ft. above the sea, has a length of 24 mi., a breadth varying from 2 to 5 mi., and an area of over 90 sq. mi. Its greatest depth is about 500 ft. The shore line varies from low marshy plains to vineyard-covered hills. The lake's principal affluent, the Thiècle or Zihl, enters at the southwest and flows out at the northeast to join the Aar. Lake steamers travel from Neuchâtel to Estavayer, and with Yverdon, these three are the principal towns on its banks.

**NEUILLY-SUR-SEINE, TREATY OF.** Some time before the Versailles Peace Conference of 1919 was ready to turn its attention to the final drafting of peace terms with Bulgaria, the first of the Central Powers in the World War to ask for an armistice, the Bulgarians submitted to that body a long memorandum explaining that their country's entry into the conflict was the fault chiefly of ex-King Ferdinand who had abdicated on Oct. 4, 1918, and that the little kingdom therefore did not merit severe punishment. Rather, for ethnological and historical reasons, it ought to receive several additions of territory, particularly in Macedonia and the Dobruja. This plea had but slight effect upon the actions of the Supreme Council, which drew up a treaty and then energetically cut short a flood of official Bulgarian remonstrances by the issuance of an ultimatum practically demanding acceptance. On Nov. 27, 1919, at Neuilly-sur-Seine, therefore, the Bulgarian premier, A. Stambulisky, became his country's sole signatory to what he most emphatically considered "a bad peace."

A large portion of the treaty, including the Covenant of the League of Nations, the Labor Convention, and a batch of penalties, was similar to the parallel sections in the treaties with Germany and Austria. Then, for strategic and railway purposes, Bulgaria was made to cede to the new state of Yugoslavia the four small areas of Tsaribrod, Bosilegrad, the Strumitsa salient, and the Timok Valley, although each of these territories contained a substantial Bulgarian majority. Western Thrace was awarded to Greece, which also benefitted by a general readjustment of the Greco-Bulgarian boundary line. Since the loss of Thrace entailed the loss of Bulgaria's coast line, the Allies promised "to ensure the economic outlets of Bulgaria to the Aegean Sea."

In order that the total number of rifles in use in Bulgaria might not exceed 33,000, the country's army was limited to 20,000 men and its other armed officials to 13,000. The Bulgarian navy was abolished, and only the retention of four torpedo boats and six motor boats for police and fishery duties was permitted. Large amounts of live stock had to be surrendered to Rumania, Yugoslavia, and Greece, and reparations obligations had to be accepted. These later were set at a total of \$450,000,000, payable in 37 years, beginning with Jan. 1, 1921. Regarded from an absolute standpoint, Bulgaria's losses in land and people were not great. But taken together with the loss of direct access to the sea, they served to make the kingdom one of the weakest of the Balkan states.

W. C. L.

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**NEUKOLLN**, a German city, called Rixdorf before 1912, which was a suburb of BERLIN until 1920, when it became the seat of the 14th municipal administrative district of Greater Berlin. It is south-

east of Berlin on the Neukolln Canal. Of the population, 25.6% are office workers and 51.4% laborers. There are many foundries and machine factories, and a score of diversified industries. Neukolln was first mentioned 1360; before 1874 it was divided into German-Rixdorf, belonging to the Order of St. John, and Bohemian-Rixdorf, settled by Protestant Bohemians. Pop. 1925, 271,330.

**NEUMANN, FRANZ ERNST** (1798-1895), German physicist, was born at Joachimsthal, Brandenburg, Sept. 11, 1798. His entire scientific career was spent at the University of Königsberg where he became lecturer in 1828, and professor three years later. His work was chiefly concerned with the optical properties of crystals, dynamical theories of the ether, spherical harmonics and the determination of specific heats of chemical compounds, in which field he discovered the law, named after him, that the molecular heat of a compound is equal to the sum of the atomic heats of its constituents. He died at Königsberg, May 23, 1895.

**NEUME**, a medieval hieroglyphic musical symbol written over a text to be chanted and roughly indicating the tone wanted. It generally resembled a shorthand character. Superior to the alphabetical system previously in force, it was used widely in the Church for several centuries until the immensely superior system of staff notation was invented about the beginning of the 11th century and perfected during the 12th to 14th centuries. See NOTATION.

**NEUMÜNSTER**, a Prussian city in the province of Schleswig-Holstein, situated about 37 mi. north of Hamburg on the Stör River. Its industries produce cloth, leather goods, colored paper and pasteboard and machines. Originally called Wipendorp, it received its present name through St. Vicelin, the apostle of Holstein, who founded an Augustinian monastery there which was transferred in 1329. Pop. 1925, 32,604.

**NEUNKIRCHEN**, a city in Rhenish Prussia, situated in eastern Saar. It has two Gothic churches and one in Romanesque style, and a statue of Baron von Stumm, whose large iron works are the chief industry of the city. In addition to the iron works, Neunkirchen has coal mines, among them the largest one in the Saar Valley, and manufacturing plants of miscellaneous character. The mining and iron industry began in the 18th century. Pop. 1927, 41,031.

**NEURALGIA**, pain along the course of a nerve without any organic disease of the nervous system. In this respect, neuralgia differs from NEURITIS. The pain, which is burning or shooting in character, occurring in attacks, may be identical with that in neuritis.

The condition is usually seen after middle life; is present more often in women than men. Such conditions as anemia, influenza, the use of alcohol, diabetes and malaria are contributing causes for the disorder.

Treatment consists of applying either heat or cold to the painful area, building up the general health

with tonics, nourishing diet and regular exercise. Massage is helpful. Injections of alcohol into the nerve trunks are used in severe cases. See also NEUROSURGERY: Brain.

**NEURASTHENIA**, a condition of nervous exhaustion, characterized by fatigue and oversensitiveness. Two forms are distinguished: (1) A true exhaustion from severe illness, starvation, hemorrhage or other exhausting condition. Evidences of the cause are present on examination, and recovery follows its remedy. Sometimes the second type follows. (2) A psychoneurosis, or an illness adopted, unintentionally, to secure escape from meeting some intolerable situation. The symptoms are exaggerations of feelings that are normal parts of anxiety or fear and may appear in almost any organ, e.g., palpitation and pain in the heart, indigestion with gas formation, colitis, disturbance of sexual functions, and loss of sleep and appetite. A fear of impending disaster, such as death or loss of the mind, is common. There is no disease of the body and recovery depends upon learning to face better the facts that seem intolerable. See PSYCHOTHERAPY.

H. D. S.

**NEURITIS**, inflammation occurring along the course of a nerve. When affecting a single nerve, it may be due to injury, exposure to cold, or may be the extension of inflammation from infection in a bone. The disorder at first consists of inflammation of the tissue around the nerves. Later on, the nerve fibers may be destroyed by pressure from this inflammation.

The symptoms depend entirely upon what nerves are affected. Pain occurs along the course of the nerve. Inflammation of many of the nerves may occur following poisoning with alcohol, lead, arsenic or mercury, in certain infectious diseases such as diphtheria, and in diabetes. Neuritis is also present in beriberi and in leprosy.

Usually the disturbance is symmetrical, that is, affects the same nerves on both sides of the body. There may be loss of power in some of the muscles.

The treatment consists in, first, efforts to remove the cause, together with rest in bed and a nourishing diet; secondly, measures to relieve pain and sleeplessness. Later on, massage and passive movements, as well as electrical treatments, may be of benefit. See also SCIATICA.

**NEUROPTERA**, the scientific name of an order of insects. It is divided into two suborders (*Megaloptera* and *Planipennia*) which are considered separate orders by some writers.

The Neuroptera usually have two pairs of membranous wings, long feelers, biting mouth parts and no tail filaments. Their larvæ are generally terrestrial, and are good friends of the gardener, as they feed to a large extent on such harmful insects as aphids. In a few cases the larvæ are aquatic.

The most familiar Neuroptera are the alder-flies; fish-flies; the lace-wings, whose larvæ are the aphid-lions; mantis flies, and the ant-lions, larvæ which build pits to capture their prey.

A. I. W.



**NEUROSURGERY**, that branch of medical science which deals with operations on the brain, and cranial nerves, spinal cord and sympathetic nerves.

Surgery of the brain deals with operations in the treatment of skull fractures, brain injuries, brain tumors, brain abscesses, neuralgia, due to cranial nerve affections, and so forth. Similar affections in the spinal cord also call for operation, while repair of injured nerves and cutting of the sympathetic nerves (which control the internal organs and blood vessels) for various diseases of the arteries and of the organs within the chest and abdomen are not uncommon.

### THE BRAIN

Disturbances in the brain from blows and accidents manifest themselves by more or less characteristic symptoms. It is helpful in making a diagnosis to know what has happened to the patient; moreover, there is evidence of fracture, which is verified by Roentgen-ray examination, and varying degrees of paralysis and unconsciousness are present.

*Injuries of the brain* may be manifested as concussion, compression, irritation, or laceration. Concussion symptoms result from the application of a sudden force to the skull and brain, with or without fracture. The resulting anemia and brain shock cause loss of consciousness and momentary paralysis.

Now, the brain exactly fills the closed cavity of the skull, so that any factor which causes the intracranial pressure results in some injury to the brain.

Hemorrhage into the brain also increases intracranial pressure, both locally at the site of the mass of blood and generally. (See APOPLEXY.)

Laceration or contusion of brain substance causes a loss of the functions mediated by the parts injured, and a rise of intracranial pressure.

Any of these conditions may call for intervention for relief of pressure. This may be effected either by the intravenous injection of strong salt solution, which draws fluid from the tissues and cavities of the brain, or by the operation of decompression. This operation has been practiced from ancient times, as evidenced by the discovery of skulls which contained round holes made during life. It was long performed by trephining, which consists in the removal of a small disc of the skull.

The skull is opened, following incision of the scalp, by making several trephine openings with special bone drills and connecting these by cutting the skull on a bevel with a Gigli saw (a wire with saw-teeth). This permits elevation of the skull in that area and the square of bone is lifted just like the lid of a box. The flap of bone is allowed to remain attached to the muscle and skin at its base, in order to have the muscle and skin serve as a hinge and furnish blood supply for the healing of the skin and bone after closure of the wound. It is known as an osteoplastic flap. In some instances, the bone can be cut away at the base of the flap in order to relieve pressure within the skull; when this is done the operation is referred to as a decompression.

*Brain tumors* may arise from any of the fundamental tissues of the brain and may develop at any age in life. They may grow into and destroy brain centers and nerves and exert indirect pressure upon them by their growth. This increase of intracranial pressure gives rise to severe headache, spontaneous vomiting, and irritation of the optic nerves. The functional interference varies with the exact site of the tumor, a point which frequently renders their localization possible.

It is desirable to remove such tumors by operation, but this is not always possible. The feasibility of operation depends upon accessibility, proximity to vital centers, the type of cells composing the tumor and the condition of the patient. Certain kinds, especially those known as gliomas, tend to infiltrate the brain, making complete removal difficult. Others, as meningiomas, are circumscribed and may frequently be removed.

Operations for their extirpation necessitate the elevation of large areas of the skull, in order to expose the underlying dura, vessels, brain, and the tumors. The tumor must be removed without causing any considerable hemorrhage. The electrocauterization of the brain substance and the suction pump have recently been introduced to advantage, especially for soft vascular tumors. In many cases, only temporary relief can be effected by decompression and the use of Roentgen rays or radium.

As a result of brain tumor or other conditions, the quantity of fluid may be increased in the ventricles of the brain or in the space between the brain and the skull. This condition, known as *hydrocephalus*, may result from (1) blockage of normal path of circulation of the fluid, (2) its excessive formation, or (3) its deficient absorption. Increased pressure is the result. This may be reduced by drainage through a small hole in the skull, but its re-occurrence must generally be prevented by extensive surgical measures directed toward re-establishment of the path of flow (see BRAIN). The site of the obstruction may be determined by measuring the pressure of the fluid in different places, and also by rendering the ventricles visible to X-ray by replacing their fluid with air. Increased pressure within them is apparent from their abnormal size. These processes are known as encephalography and ventriculography.

*Brain abscess* follows infection of the brain and is frequently due to extension of infection from the mastoid and frontal sinuses. It results also from contamination and general infection, such as that observed in disease of the lung. Treatment consists in supporting the patient until the system has developed immunity and has walled off the abscess. Then, thorough drainage should be instituted.

*Neuralgia*, such as trigeminal neuralgia or tic douloureux, which affects the fifth cranial nerve, and glossopharyngeal neuralgia, which affect the ninth cranial nerve, is due to disease of the nerve centers (ganglia). Permanent relief can be afforded only by operation within the skull and cutting of the nerve

roots behind the ganglia before the nerves enter the brain. Cutting of the root interrupts the sensation of pain and produces numbness in the region supplied by the nerve. Injection of alcohol into the nerve or ganglia has also proved effective in relieving the pain.

Brain surgery has greatly advanced in late years, due largely to improvements in anesthesia, closer localization of tumors, the application of X-rays, perfection of devices for the rapid removal of bone, and the perfection of aseptic technique.

#### SPINAL CORD

In affections of the spinal cord, the spinal canal is opened by incising the skin, pulling aside the skin and muscle, and removing the back parts of the vertebrae. Extreme care is necessary in handling the spinal cord tissue, to prevent injury and paralysis, but it is possible to remove certain areas of bone with safety in order to remove tumors and to cut nerves that arise from the spinal cord for relief of pain. It is unnecessary to replace the bone removed from the vertebrae, if the muscles and the sheets of fascia are properly sewed together, since the front part of the vertebrae serve as the weight-bearing portions of the spinal column.

*Spinal injury* may result in fracture or dislocation of the vertebrae, with paralysis below the site of injury. Inability to hold urine and feces are serious complicating symptoms; the higher the fracture, the greater is the paralysis and the more serious the injury.

*Tumors of the spinal cord*, like tumors of the brain, may arise from any of the primary tissues of the spinal cord and its coverings. They differ from brain tumors in that the larger majority of them are circumscribed and can be removed. They produce symptoms similar to those of brain tumor and are diagnosed by disturbances in reflexes, in sensation, and in motor power. Occasionally, special tests and injection of an oil (lipiodol) that will show in the Roentgen ray film are required to demonstrate the exact level of the tumor, similar to the Roentgen ray method used in the brain. *See also* SPINAL COLUMN, SURGERY OF.

#### REGENERATION OF NERVOUS TISSUE

Following injury of the nerves, the portions beyond the point of injury disintegrate, but they will grow out again, in from six to eighteen months, if the cut ends are carefully sewed together. The nerves must grow downward through the old nerve sheath and form new end bulbs before responses can be transmitted to and from the skin and underlying tissues. This phenomenon that is seen in the nerves fails to occur in the spinal cord and brain. It is possible to sew together the severed cord and cut brain, but regeneration will not take place.

#### SYMPATHETIC NERVES

Sumptectomy, or cutting of the sympathetic nerves, is one of the more recent phases of surgery

of the nervous system and is employed for the relief of spasm of the walls of arteries and of the muscles that are found in some internal organs. Diseases resulting from over-activity of the sympathetic nervous system are Raynaud's disease, scleroderma, and thrombo-angiitis obliterans. *Raynaud's disease* results in blue, cold, painful fingers and toes, with ulceration of the tips. *Scleroderma* occurs in the same regions and produces pain, shrinkage, contraction, hardening, and ulceration of the skin, with deformity of the joints. *Thrombo-angiitis obliterans* consists in clotting of the blood in arteries and veins and is responsible for certain aspects of angina pectoris. Over-activity of the sympathetic nervous system may interfere also with normal function of the bowel and bladder and may give rise to what is known commonly as *Hirschsprung's disease* and to inability of the bladder to empty itself of urine. It disturbs, also, the function of other visceral organs investigation of which is being carried on at this time.

*See also* BRAIN; PITUITARY BODY; NERVOUS SYSTEM; SPINAL COLUMN, SURGERY OF; SPINAL CORD.

A. W. A.

**NEUSE RIVER**, a river of North Carolina, formed by two branches rising in Person and Orange counties at the northern border of the state. It flows generally southeast by a devious course and empties into Pamlico Sound through an estuary 34 mi. long and from 2 to 5 mi. wide. The total length of the stream is about 300 mi. and it is navigable by steamboats to Goldsboro, 70 mi. from its mouth. The upper reach of the Neuse crosses the tableland of central North Carolina and the lower course flows through the sandy coastal plain. On it are situated the cities of Selma, Goldsboro, Kinston and Newbern, which is at the head of the estuary.

**NEUSS**, a city in Rhenish Prussia, located near the Rhine four miles west of Düsseldorf and joined to the Rhine by a canal. It has, among other interesting buildings, the imposing St. Quirinus Church in late-Romanesque style, begun in 1209, a town hall, built in 1634-38, and a medieval town gate, built in the 13th and 14th centuries. There are many factories producing diversified commodities. Neuss is an important river port and has much trade in grain and cattle. It takes its name from the Roman Novesium, founded in 25 A.D., and interesting Roman remains have been found in the vicinity. Pop. 1925, 44,890.

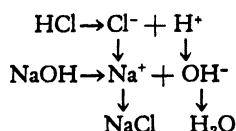
**NEUSTRIA**, the ancient name of the western kingdom of the Franks, situated on the north coast of Gaul and covering what is now Normandy and part of Brittany. Austrasia, or the eastern kingdom of the Franks, touched it on the east. The name has also been applied to other parts of the Frankish domain, as Neustria and Austrasia were at one time ruled by one king.

**NEUTRALITY**, a legal status growing out of a state's refraining from participating in a war between other states, and the holding by it of an attitude of impartiality in relations with the belligerent (*see*

**BELLIGERENCY**) states. It also implies a recognition by the belligerents of the fact of abstention and of impartial attitude. Rights and duties of neutrals and belligerents arise from this status. It is therefore not merely a policy of inaction but an active status, under which the neutral state seeks by positive and definite measures to discharge its obligations and maintain and preserve its rights. The obligation of impartiality must be observed as regards the belligerent.

**NEUTRALIZATION**, a term used in **RADIO FREQUENCY** circuits to denote the feeding of energy into a **CIRCUIT** in the proper amount and in the correct phase relation to annul completely the undesired effects of a source of **ALTERNATING CURRENT** in the same circuit. The use of the term is best known in connection with tuned **RADIO RECEIVERS**. By properly arranging **INDUCTANCES** and **CONDENSERS**, the natural tendency of the circuit to oscillate because of the capacity between the **GRID** and **PLATE** of the tube may be annulled. Usually very small variable condensers called neutralizing condensers, are used.

**NEUTRALIZATION**, in chemistry, the reaction taking place when dilute solutions of two **ELECTROLYTES**, one an acid and the other a base, are mixed together, producing a salt and water. The general plan of neutralization is shown in the formula:



**NEUTRALS**, a federation of Iroquoian Indian tribes, also called **ATTIWENDARONK**.

**NEUTRODYNE**, the trade name of the first extensively marketed **RADIO RECEIVER** that employed tuned and neutralized (*see* **NEUTRALIZATION**) **RADIO FREQUENCY** amplification. *See* **RADIO COMMUNICATION**.

**NEUTRON**. *See under* **COSMIC RAYS**.

**NEVADA**, one of the western states of the United States, popularly called the "Sagebrush State." It is situated between 35° and 42° N. lat. and about 114° and 120° W. long. On the north it is bounded by Oregon and Idaho, on the east by Utah and Arizona, being separated from the latter in part by the Colorado River, and on the southwest and west by California. Nevada comprises an area of 110,690 sq. mi. inclusive of 869 sq.



NEVADA STATE SEAL

mi. of water surface. In size Nevada ranks sixth among the states of the Union.

**Surface Features.** Nevada lies entirely within the Great Basin and its surface is about equally divided between short, isolated mountain ranges and the desert basins which separate them. The typical basin range is from 50 to 75 mi. long, 6 to 15 mi.

wide, and from 7,000 to 10,000 ft. above sea level. Within its length there are no great or sudden variations in height and breadth, although the crests may be very jagged as the ranges are excessively dissected and worn. Generally they run north and south and are parallel. The state has a mean elevation above sea level of 5,500 ft. Its highest point, 14,145 ft., occurs in Esmeralda Co. on the summit of East or Boundary Peak; its lowest, 470 ft., in Clark Co. where the Colorado River flows into California.

The desert basins between the ranges are level and covered with fine alluvium carried there from the mountain sides by the streams which disappear in the sands or evaporate when they emerge from their narrow cañon walls. Sometimes temporary playa lakes of great extent are formed after sudden cloudbursts, and a few permanent lakes exist in western Nevada where the drainage from the Sierra Nevada Mountains is sufficient to maintain them. Pyramid and Humboldt are remnants of the former Lake Lahontan which covered an area of 8,422 sq. mi., the shore line of which is marked on the basin ranges, 500 ft. above the present valley floor.

As is characteristic of the Great Basin, the drainage of Nevada has no outlet to the sea. The only permanent streams are those coming from the Sierra Nevada on the west, except for the Humboldt River which derives its waters from the interior basin ranges. It rises in the northwestern part of the state, meanders in a southwestward direction for 350 mi., and finally disappears in Humboldt Lake or Sink.

Considerable areas are absolute deserts, among which are the Carson Sink, and the Smoke Creek and Black Rock deserts. Most of the ranges are desert except the few having scattered pinyon or dwarf cedars on their middle slopes. An appearance of widespread desolation prevails except at sunset when the mountains glow with rich colorings brought out by the slanting rays of the sun on the multi-tinted volcanic rocks.

**Climate.** Because of its situation in the Great Basin and its high average elevation, the climate of Nevada, though exhibiting wide extremes of temperature is, on the whole, cool, clear, dry and invigorating. The mean annual temperature is 50.3° F. with a difference of only six degrees between the north and the south. At Reno the average for January is 32.5° F. and for July 67.5° F. In the period 1890-1930, the highest temperature recorded in Nevada was 122° F. and the lowest -45° F. The average annual precipitation is 9 in. At Reno the average growing season is 146 days.

**Forests and Parks.** Practically all the forested land bearing any appreciable forest growth is included in 8 national forests with a total net area of 4,978,400 acres. Three of these forests, the Humboldt, Nevada and Toiyabe, are entirely within the state of Nevada, four extend over the boundary from California and the Dixie is partly in Utah.

The largest of these forests, the Toiyabe, has a total net area of 1,883,029 acres and lies upon several moun-

tain ranges in the central part of the state. They are covered for the most part with poor and scattered stands of conifers, chiefly pinyon and juniper with some western yellow pine and Engelmann spruce. Above 6,800 ft., stunted mountain mahogany is found. In the vicinity of the old mining camps, the timber has been heavily cut. Grazing is unrestricted. Lehman Caves National Monument is located within the Nevada National Forest.

**Minerals and Mining.** With the discovery in 1859 of the famous Comstock lode, near Virginia City, Nevada became an important producer of precious metals. During the period from 1860 to 1890, when the lode became apparently exhausted, this remarkable vein yielded gold and silver to the value of about \$350,000,000, reaching its maximum annual output, nearly \$40,000,000, in 1877. Following rich discoveries at Goldfield and elsewhere in 1906, the state again took prominent rank as a producer of gold and silver. In 1908 copper, which had been sparingly mined for 35 years, assumed importance; in 1914 Nevada stood first in silver, fourth in gold and fifth in copper, showing also substantial yields of lead and zinc. Mineral production in the state attained its maximum in 1917 with an output valued at approximately \$55,000,000.

With mineral productions in 1929 amounting to \$36,776,293, Nevada stood twenty-seventh among the states, ranking second in mercury and sulphur, fifth in silver and copper, and sixth in gold.

The outstanding product was copper, 140,138,809 lbs. valued at \$24,664,430. Other products of importance were gold, 163,711 oz., \$3,384,211; silver, 4,923,526 oz., \$2,624,239; gypsum, 225,514 tons, \$1,290,854; lead, 9,846 tons, \$1,240,632; zinc, 8,460 tons, \$1,116,725; and mercury, \$588,453.

During 1929 107 mines and quarries gave employment to 5,281 persons who received \$9,539,731 in salaries and wages.

**Soil.** Sand and gravel loams constitute the soils commonly prevalent in Nevada. Some sections, however, possess rich alluvial deposits left in the basins of old lakes. The most productive soils of the state are in the extreme west central section where limited areas have been developed by irrigation. In the south there are immense tracts of unreclaimable desert due to vast alkaline deposits and extremely scant rainfall.

**Agriculture.** Because of the general aridity of the climate the production of field crops is limited.

In 1930 4,080,906 ac. or 5.8% of the entire land area was in farms, 3,442 in number, with an average size per farm of 1,185.6 ac. and an average value per acre of \$15.71. Of the farm area 494,307 ac. was crop land, and 3,310,615 ac., pasture land. The total value of farm property was \$97,189,562, of which \$64,111,000 was represented by land and buildings; \$4,218,855, by implements and machinery; and \$28,859,707, by domestic animals.

According to the census of 1930 Nevada produced in 1929 field crops to the value of \$8,703,428, ranking forty-seventh among the states. The chief crops were

grain \$5,580,425, hay \$1,758,525, and vegetables \$1,246,092. The grains included wheat, 355,890 bu., barley, 196,823 bu., and oats, 102,024 bu. Of the hay crop of 544,737 tons alfalfa contributed 336,235 tons. The leading vegetables produced were potatoes, \$862,005, and cantaloupes \$102,589. Farm products sold by cooperative marketing rose from \$8,300 in 1919 to \$1,648,299 in 1929. Farm machinery and equipment in 1930 included 2,921 automobiles, 1,241 motor trucks, and 360 tractors.

**Irrigation.** Crop production throughout the state depends almost entirely upon irrigation, 98% of the crop land being irrigated. In the Census of 1930 irrigation operations were reported for every county in Nevada. Irrigation has been most extensively developed in the drainage basin of the Humboldt River in Elko and Humboldt counties in the northeastern part of the state, and in the basins of the Truckee, Carson and Walker rivers, mostly in Lyon, Churchill, Washoe and Douglas counties in the general vicinity of Carson City near the California boundary. These two districts contain five-sixths of the irrigated lands of the state. The irrigated farms comprised 88% of the number and 94% of the value of all farms in Nevada. The proportion actually irrigated was 11.9% of all land in farms and 0.7% of the land area of the state.

The total number of irrigated farms was 3,031, with an aggregate area of 3,102,085 ac., of which 486,648 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$59,956,787, or an average of \$19.33 per ac. The total investment in irrigation enterprises to 1930 was \$15,457,931 and the average cost of maintenance and operation for 1929 was \$0.91 per ac.

**Animal Industry.** Cattle- and sheep-raising are the chief livestock interests. According to the census of 1930, Nevada ranked forty-first among the states in the total value, \$28,859,707, of domestic animals on farms. Among these were cattle, 308,482, valued at \$16,332,804; sheep, 1,201,837, \$9,571,745; horses, 40,559, \$2,212,960; mules, 3,166, \$183,953 and swine, 22,746, \$241,784.

Of the cows on farms 134,602 were kept mainly for beef production and 23,422 mainly for milk production. In 1929, 12,108,432 gals. of milk were produced; the total value of dairy products marketed was \$1,942,175. The wool clip, 7,398,470 lbs., was valued at \$2,060,853. The poultry raised, with a value of \$752,538, included chickens, 439,331 in number valued at \$424,493, and turkeys, 89,573, \$320,425. Of 2,145,770 doz. chicken eggs produced, valued at \$683,376, 1,466,759 doz., with a value of \$463,185, were sold.

**Fisheries.** There are no commercial fisheries in the state. In 1930, 6,748 fishing licenses were issued and \$10,462 was received in fees. From 3 hatcheries, operated at a cost of \$13,500, 1,142,750 trout were distributed in state waters. In addition, also in 1930, 901,500 rainbow trout, 150,000 loch leven trout and 20,000 brook trout were planted by the U.S. Bureau of Fisheries.

# NEVADA



COURTESY RENO CHAMBER OF COMMERCE.

## SCENES IN AND NEAR RENO, NEVADA'S LARGEST CITY

1. Washoe County Court House, Reno, where hundreds of thousands of divorces are granted annually to persons from every state in the Union.
2. Business center of the city from the air.
3. "Down the Canyon" from Reno—United States Transcontinental Highway 40.
4. Campus and buildings of the University of Nevada.





Area 110,690 sq.m.  
Pop. 91,058

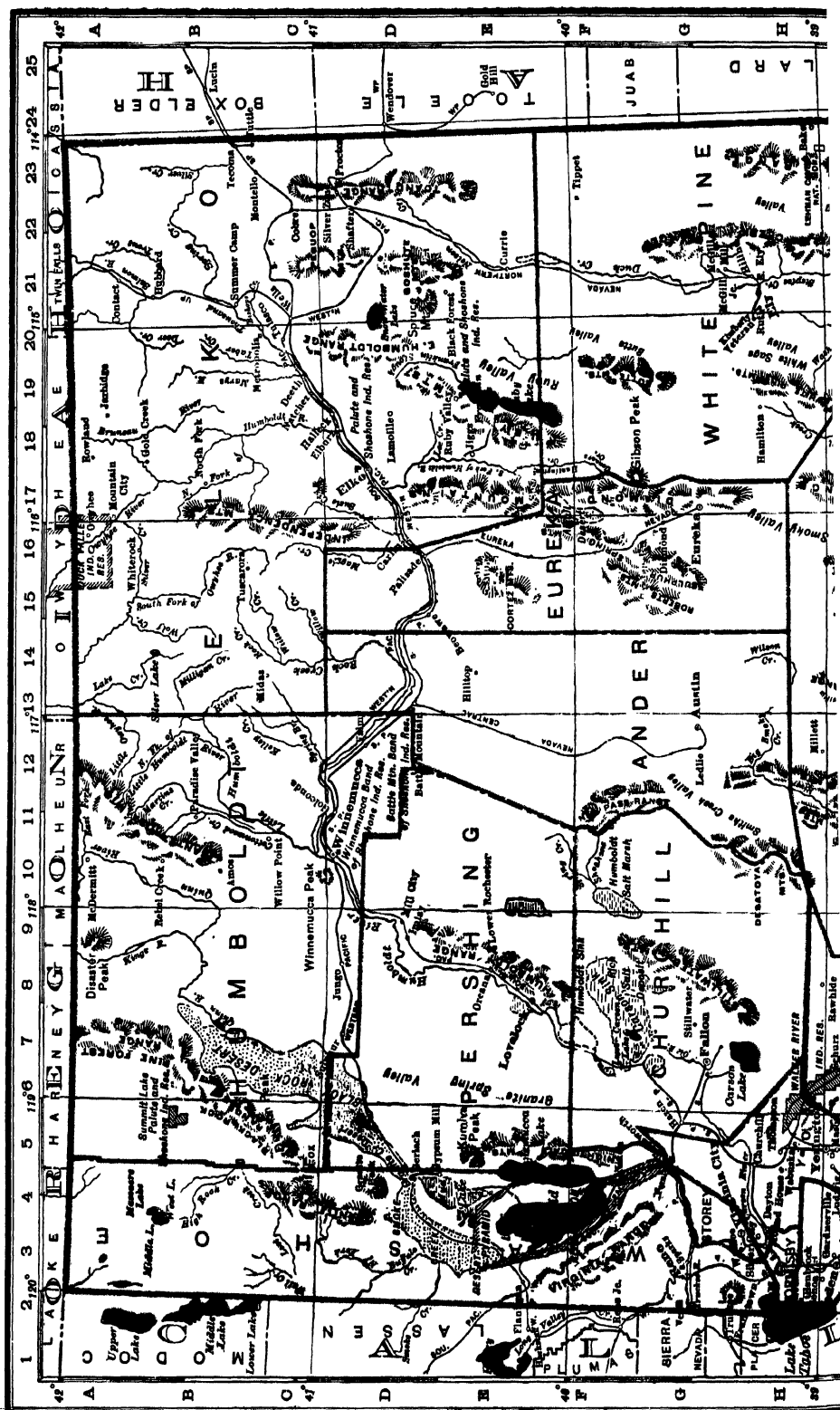
Area 110,690 sq.m.  
Pop. 91,058

**Pop.—Thousands**

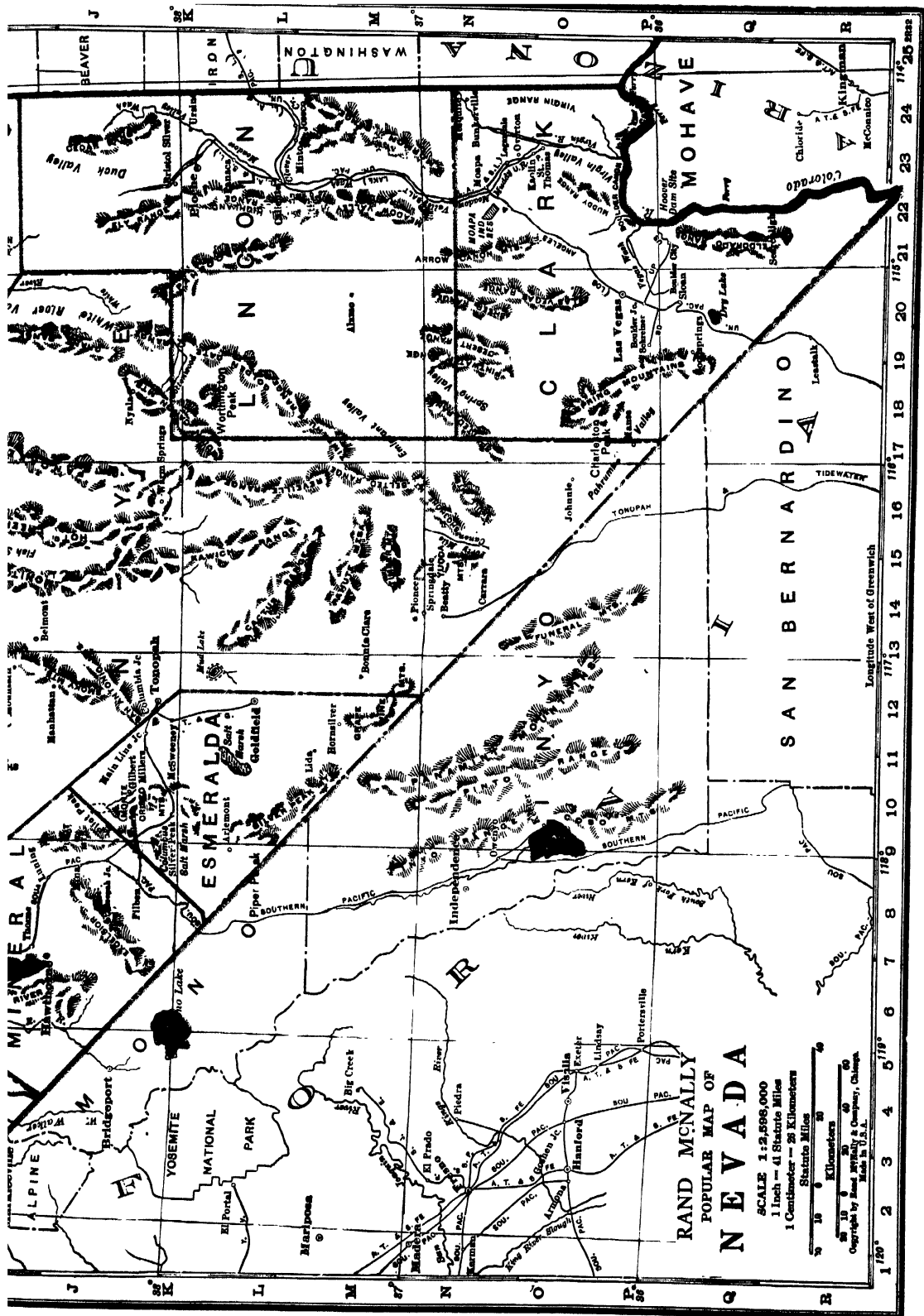
- Pop.—Thousands**
- |                        |      |
|------------------------|------|
| 1 Battle Mountain..... | D 13 |
| 2 Carson City.....     | H 3  |
| 3 Elko.....            | D 17 |
| 3 Ely.....             | H 21 |
| 2 Fallon.....          | G 20 |
| 5 Las Vegas.....       | P 6  |
| 1 Lovelock.....        | E 8  |
| 19 Reno.....           | G 3  |
| 5 Sparks.....          | G 3  |
| 1 Winnemucca.....      | C 10 |
| 1 Yerington.....       | H 5  |

1 Black Forest

- |                           |      |
|---------------------------|------|
| Black Forest              | E 21 |
| 8 Carlin                  | D 18 |
| 1 Currie                  | E 21 |
| 1 Deeth                   | C 19 |
| 4 Fernley                 | C 14 |
| 1 Glenbrook               | H 2  |
| 3 Golconda                | C 12 |
| 1 Gold Creek              | C 18 |
| 1 Hilltop                 | E 19 |
| 4 Imlay                   | E 14 |
| 1 Kaolin                  | O 23 |
| 2 Logan                   | O 23 |
| 3 Lower Roches-<br>ter    | E 9  |
| 2 Manhattan J             | E 12 |
| 3 Mason                   | O 19 |
| 1 Mill City               | D 5  |
| 5 Mont.                   | O 23 |
| 1 Nysa                    | E 18 |
| 1 Oreana                  | J 18 |
| 5 Paradise                | E 19 |
| 1 Valley                  | B 11 |
| 1 Rand (Nolan)            | E 7  |
| 2 Round Moun-<br>tain     | I 12 |
| 2 Ruby Valley             | E 19 |
| 1 Silver City             | H 3  |
| 2 Sloan                   | O 20 |
| 4 Stewart                 | H 3  |
| 1 Valmy (Stone-<br>house) | D 12 |
| 1 Wellington              | A 10 |
| 7 Willow                  | C 12 |
| 1 Willow Point            | C 11 |



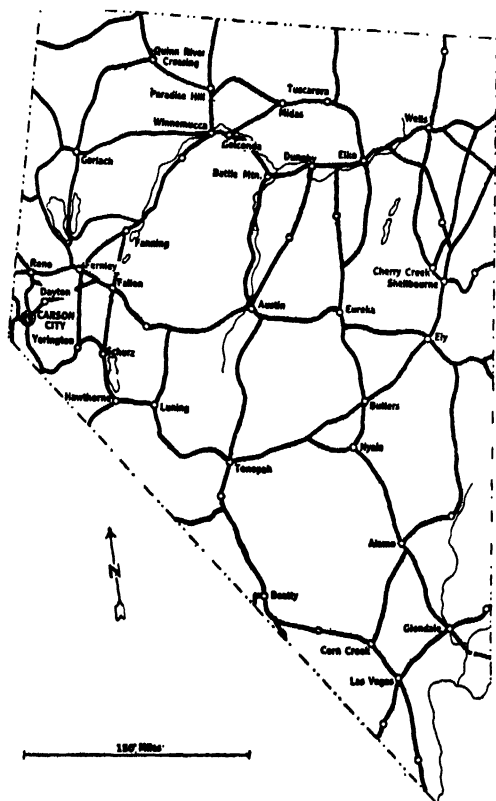






**Transportation.** Transportation by waterway is negligible in Nevada. The state is crossed by three transcontinental systems, the Southern Pacific, the Western Pacific and the Los Angeles and Salt Lake division of the Union Pacific. Branch lines serve the more important towns, forming a state steam railway system with a total mileage of 2,123 in 1930.

Automobile transportation has steadily increased. There were 25,777 mi. of highways in the state on Jan. 1, 1930, including 2,237 mi. of surfaced roads and 1,560 mi. of improved state highways. Highway



NEVADA STATE ROADS

expenditures during 1929 were \$3,281,943, of which \$2,646,895 was paid by the state and \$635,048 by county and local governments. The state gasoline tax produced an income of \$675,012 in 1930 as against \$405,818 in 1926. Motor vehicle registrations were 29,645 in 1930 compared with 21,169 in 1925. The rapid growth of transportation by truck is shown by the registrations, which increased from 3,100 in 1925 to 6,257 in 1930, or over 100%. During the same period the number of buses in operation almost doubled, rising from 86 to 151.

**Manufactures.** The manufacturing industries of the state are of minor importance. According to the Census of 1930 Nevada with manufactures for 1929 valued at \$33,717,059 stood forty-seventh among the

states. Its 123 establishments gave employment to 364 officers and employees, who received \$813,640 in salaries, and to 2,200 wage earners, who were paid \$3,585,425 in wages. These factories used a total of 27,197 horse power, expended \$752,238 for fuel and power, and \$24,899,633 for material and supplies, and added by the process of manufacture \$8,065,188 to the value of their output.

Reno, with products amounting to \$3,424,402 in 1929, is a leading manufacturing city.

**Commerce.** According to the census of 1930, there were in 1929 96 wholesaling establishments in Nevada, with total sales of \$13,718,677. These organizations gave full-time employment to 679 men and women, whose annual salaries and wages aggregated \$877,473.

The total sales of the 1,312 retail stores amounted to \$50,088,632. Sales per capita were \$550.06. This figure was exceeded only in California and New York State. Average sales per store, which were \$38,177, were surpassed only in Michigan and Massachusetts.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive	285	\$11,960,453	23.87
General Mdse.	190	11,436,396	22.81
Food	249	9,433,205	18.84
Apparel	100	2,971,765	5.93
Furn. & Household	43	1,254,479	2.51
Lumber & Bldg.	61	2,913,683	5.82
All other stores	384	10,118,651	20.22

Total, all stores	1,312	\$50,088,632	100.00
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**Finance and Banking.** The assessed value of all taxable property in 1929 was \$173,373,698; the basis of assessment, 60%. The total state debt in 1930 was \$1,648,659. Total state revenues for 1929 were \$6,859,896. The chief sources of revenue were property taxes, \$1,399,047, gasoline tax, \$697,037 and automobile license tax, \$296,530. Total disbursements were \$6,697,353, with highway expenditures, \$2,211,640, public school aid, \$435,694 and other educational expenses, \$285,159 the principal payments.

There were 35 banks in Nevada in 1930. Of these, 10 were national banks, 24 trust companies and state banks and 1 private bank. Their total capital was \$3,316,600; their surplus and undivided profits, \$2,000,000. Total resources were \$48,473,000, with loans and discounts aggregating \$28,135,000. Demand and time deposits totaled \$38,154,000. Per capita demand and time deposits were \$419.27; per capita savings deposits, \$230.74. The total savings of \$20,997,000 were owned by 25,043 depositors. National bank circulation aggregated \$1,194,000.

**Government.** The law-making body of Nevada is vested in a legislature consisting of a Senate composed of 17 members and a House of Representatives of 37 members, the former elected for terms of four years and the latter for terms of two years, meeting in biennial sessions limited in duration to 60 days. The executive department of the state consists of a governor, lieutenant governor, secretary of state, treasurer, comptroller, inspector of mines, superintendent

of public instruction, surveyor-general and attorney-general. The governor is elected for a term of four years at a salary of \$7,000 per year. Judicial power is vested in a supreme court, in district courts, and in justices of the peace. The supreme court consists of three judges elected for terms of six years at salaries of \$6,000 per annum.

**Social Welfare Institutions.** There is a school of industry for male juvenile delinquents at Elko and a hospital for mental diseases at Reno. The state prison and an orphan home are situated at Carson City.

**Education.** The first school law in Nevada was enacted in 1861 by the territorial legislature. When Nevada was admitted into the Union in 1864, although the school census showed only 2,601, the constitution provided for a complete school system passing through all grades up to the State University, which was established at Elko in 1874. In 1930 there were 330 elementary schools with 14,295 pupils enrolled and 637 teachers. The 33 public high schools had 3,762 pupils and 229 teachers. All children from 8 to 16 years of age are required by law to attend school the full school year.

The number of persons from 5 to 20 years of age attending school in 1930 was 17,276, or 74.7% of the population within the ages specified, as compared to 12,611, or 68.4%, in 1920. The number of persons 10 years and over unable to read and write in 1930 was 3,330, or 4.4%, as compared to 3,802, or 5.9%, in 1920. The only institution of higher learning in the state is the University of Nevada at Reno, which includes the Mackay School of Mines.

**Population.** In 1930 Nevada ranked forty-eighth among the states with a population of 91,058 or an average of 0.8 per sq. mi., an increase of 13,651 or 17.6% over 1920. The population rose from 6,857 in 1860 to 42,335 in 1900, 81,875 in 1910, and 77,407 in 1920. In 1930 there were 81,425 or 89.4% whites, 4,871 or 5.3% Indians, 3,090 or 3.4% Mexicans, and 516 or 0.6% Negroes. Of the whites, 69,150 were native-born and 12,275 were foreign-born. The rural population was 56,594 or 62.2% of the total, a decrease of 5,559 or 8.9% from 1920; the urban population was 34,464 or 37.8% of the total, an increase of 19,210 or 125.9% since 1920. In 1930 the two largest cities were Reno, 18,529 and Las Vegas, 5,165.

**Occupations.** In 1930 42,884 persons, or 47.1% of the population, were gainful workers 10 years old or older; 86.2% of these were males and 13.8% were females; 70% were native white; 19.6% foreign-born white; 0.8% Negro, and 9.6% other races. Among the chief occupations, with number of workers, were agriculture, 8,903; manufacturing, 7,991; transportation and communication, 5,867; mining, 5,000; domestic and personal service, 4,676; trade, 4,326, and professional service, 3,149.

### HISTORY

Francisco Garces, a Franciscan friar, on his way from Mexico to California in 1775 passed across the

extreme southern corner of Nevada; no earlier visit by a European is recorded. In 1825 Peter Skene Ogden's party of HUDSON'S BAY COMPANY trappers entered Nevada from the north, discovering the Humboldt River. Jedediah Smith, the American explorer, traversed the state from west to east in 1826, and other trappers entered the region despite the hostility of the Indians. FRÉMONT in 1843-1845 was the first to explore the territory systematically. In 1848 the Nevada country was acquired from Mexico by the TREATY OF GUADALUPE-HIDALGO. Until then a part of California known as Washoe Co., that portion of the present state east of the crest of the Sierra Nevada Mountains was included in the formation of the Territory of UTAH in 1850. In the line of overland travel to California, Nevada had first been crossed by emigrant caravans in 1841; when the discovery of gold accelerated the travel, the Mormons in 1849 established a trading depot at Genoa. Gold was discovered in the same year by William Prouse near Virginia City, and settlement entered the Carson Valley. Since the territorial government of Utah was too remote, in 1853 and again in 1856 the inhabitants of Carson Valley petitioned for annexation to California. In 1857 a petition for separate territorial government was sent to Congress, and the next year a convention met at Genoa, adopted a constitution, and attempted unsuccessfully to establish a state government. With the discovery of the Comstock Lode in 1859 and of other rich mineral deposits in quick succession, an immediate wave of population swept into the Washoe district, and Congress, Mar. 2, 1861, gave Nevada separate territorial status. The boundaries were enlarged in 1862 and 1866, until Nevada attained its present limits. A proposed state constitution was rejected at the polls in January, 1864; but because two additional loyal votes were needed for President Lincoln's RECONSTRUCTION program, a third constitutional convention met at Carson City and drafted a constitution which was quickly ratified. On Oct. 31, 1864, Lincoln proclaimed the admission of Nevada into the Union. The federal census of 1870 reported a population of 42,491. The history of the state reflects sharply the vicissitudes of the mining industries; but since 1900 large-scale irrigation has permitted development in ranching and agriculture (*see* HOOVER DAM). Republican since 1920, in 1932 Nevada voted for Roosevelt and elected Patrick A. McCarran, Democrat, to the Senate.

**BIBLIOGRAPHY.**—Thomas Wren, *A History of the State of Nevada*, 1904; S. P. Davis, *The History of Nevada*, 1913.

**NEVADA**, a city in southwestern Missouri, the county seat of Vernon Co., situated 100 mi. south of Kansas City. Two railroads serve the city. There are coal fields in the vicinity. The countryside produces chiefly hay, grain and clover. Nevada has flour mills, galvanized iron works, a cheese factory, railroad yards, poultry packing houses and planing mills. Iron and sulphur springs are found within the city. Located here are the Cottey College for Girls, the State Eleemosynary Hospital for the Insane and a United

States Army Reservation. Nevada was laid out in 1855 and incorporated in 1880. Nevada was called Nevada City until 1869. Pop. 1920, 7,139; 1930, 7,448.

**NEVADA, UNIVERSITY OF**, at Reno, Nev., a coeducational state institution, founded in 1873 and opened in Elko in 1874, where for 12 years it was operated as a preparatory school. In 1886 the school was moved to Reno, and opened as a university. In addition to the regular college courses in classics, literature and general science, there are courses in engineering, domestic science and agriculture. The Nevada State Normal School is under the direction of the university. The grounds and buildings were valued in 1931 at \$2,303,832. The library contained 53,876 volumes. In 1931-32 there were 1,050 students, and a faculty of 76 headed by Pres. Walter E. Clark.

**NEVE**, a granular, partially compacted substance, intermediate between snow and ice, to which the Swiss term *finn*, meaning last year's snow, is also applied. It is found beneath the surface of the vast snowfields which feed the glaciers in the Alps and other lofty mountainous regions. Fresh fallen snow is light because the loose crystals are separated by air. Even at low levels this fluffy character is soon lost. In deep, long-lying alpine snows, pressure gradually forces the crystals into closer and closer contact, squeezing out the air. Alternate melting, freezing, and evaporation favor the growth of large crystals at the expense of smaller neighbors, till they become crystalline grains. When these become loosely bound into a mass by a cement of ice, neve, or glacier snow is formed. Further compacting in the depths of the snowfields transforms the neve into the granular flowing ice of the glacier.

**NEVERS**, a city of central France located on the Loire and capital of the department of Nièvre. Julius Caesar had an army camp here which was a strategic post in his conquest of Gaul. An attractive town in its new and old quarters, Nevers possesses in its Palais de Justice the 15th-16th century ducal palace which is considered one of the finest feudal edifices in central France. Pottery making is the chief industry. Pop. 1931, 31,879.

**NEVILS, WILLIAM COLEMAN** (1878- ), American educator and clergyman, was born in Philadelphia, Pa., May 29, 1878. He was educated at St. Joseph's College, Philadelphia, and in 1911 was ordained a Roman Catholic priest. Until 1918 he served as instructor in Latin and Greek, professor of rhetoric and professor of philosophy in various Catholic institutions, and that year became dean of Georgetown University. After a year in this office he served as chancellor until 1924, and the following four years was dean of the Shadowbrook Jesuit House of Studies. In 1928 Nevils returned to Georgetown University as president.

**NEVIS**, an island of the Lesser Antilles group, British West Indies, belonging to the colony of the **LEEWARD ISLANDS**, situated in 17° 37' N. lat., 62° 37'

W. long., embracing an area of 50 sq. mi. The island rises gradually from the sea to a central peak 3,500 ft. in altitude. On the fertile slopes cotton, corn, coconuts, coffee and a large variety of tropical fruits are cultivated. The capital and chief settlement is Charlestown. Jointly governed with Nevis are SAINT CHRISTOPHER, from which it is 2 mi. distant, and Anguilla. Columbus discovered the island in 1498 and in 1628 the English established a settlement on Nevis. Est. pop. with Saint Christopher, 1930, 30,933.

**NEW ALBANY**, a city of southern Indiana and county seat of Floyd Co., on the Ohio River across from Louisville, Ky. The two cities are connected by river steamers and a railroad bridge over which an inter-state electric line operates. It is intersected by Federal highways, and is on several railroads. Woodworking leads the city's manufactures. In 1929 the value of the factory output was about \$14,000,000; the retail trade amounted to \$10,759,203. New Albany is situated in the hill country of southern Indiana which abounds in scenic and historic spots, including Marengo limestone cave and Wyandotte cave; the first State capitol, at Corydon; the birthplace in Salem of John Hay, diplomat; and "Hole Tavern" or "High Street House," New Albany, where Daniel Webster, Andrew Jackson, and Henry Clay stopped. In 1813 Joel Scribner founded the city, which has a charter from 1839. Pop. 1920, 22,992; 1930, 25,819.

**NEWARK**, a municipal borough of Nottinghamshire, England, lying on the Devon near its junction with the Trent, 120 mi. northwest of London. Probably of Roman origin, it is situated upon the ancient Fosse Way. The castle, traditionally founded by Egbert of the West Saxons, now lies in ruins, and there are the splendid Perpendicular parish church and the beautiful 15th century Beaumont cross among other antiquities. It boasts many modern public buildings, and thriving foundries, breweries, and agricultural implement manufactures. There is also a large trade in coal, cattle, malt and corn. Pop. 1921, 16,958; 1931, 18,055.

**NEWARK**, the largest city of New Jersey, port of entry and county seat of Essex Co., located on the west side of Newark Bay and the Passaic River, 8 mi. west of lower Manhattan, New York. It occupies an area of approximately 24 sq. mi. level along the bay and river and rising to the west.

The city is characterized by wide business thoroughfares, shaded residential streets and parks and fine public buildings and churches. The intersection of its two principal business streets, Broad Street, 120 ft. wide, and Market Street, 90 ft. wide, is noted for the density of its traffic. Its parks and public playgrounds occupy an area of approximately 950 acres. In the parks and in connection with its public buildings are many outstanding examples of American sculpture. It is the seat of many educational institutions among which are the State Normal School, New Jersey Law School, New Jersey College of Pharmacy, and Newark College of Technology.

Newark is the trading center for a group of contiguous municipalities with an aggregate population of over 1,100,000; it also is an important manufacturing and financial center. According to the Census of 1930 there were, in 1929, 603 wholesale establishments with net sales of \$382,905,467 and 7,179 retail establishments with net sales of \$328,119,396. In the same year the city's manufactures were valued at approximately \$500,000,000. The financial institutions include the home offices of some of America's largest life and fire insurance companies. Among the numerous industries are included the production of leathers, electrical and radio equipment, thread, chemicals, paints, jewelry, automobile accessories, steel office furniture, and equipment for the control of interior temperature and humidity. Port Newark is an important storage and distribution point of lumber shipped to the East by water.

The transportation facilities include the Pennsylvania, Lackawanna, Erie, Central of New Jersey, and Lehigh Valley railroads; the Hudson and Manhattan tubes, which connect with both downtown and midtown Manhattan; extensive trolley and bus systems; numerous air lines, operating out of Newark airport, the eastern terminus of the U.S. air mail; and a number of trans-oceanic and coastal steamship lines, docking at Port Newark. A unique feature of the extensive highway connections is a super-highway, elevated over Newark, crossing the Passaic and Hackensack rivers by means of bridges with 135 ft. clearances, this permitting an uninterrupted flow of traffic to the Holland tunnel in Jersey City.

Newark was settled in 1666 by a band of Puritans led by Robert Treat and was named after Newark-on-Trent, the former home of their first pastor, Reverend Abraham Pierson. It was incorporated as a township in 1693 and received its charter as a city in 1836. It has the commission form of government. Pop. 1920, 414,524; 1930, 442,337.

**NEWARK**, a village in Wayne Co., western New York, situated on the State Barge Canal, 30 mi. southeast of Rochester. Bus and truck lines and four railroads afford transportation. There is a Federal emergency landing field. Fruit and vegetables are produced in this region. Newark is an important shipping market for nursery stock. The village has many industries, including food canning, the manufacture of sanitary food containers, furniture and kitchen-ware; there are also machine shops. The charming Finger Lakes region, with many popular resorts, and Lake Ontario are easily reached from Newark. The State School for Mental Defectives is located here. Pop. 1920, 6,964; 1930, 7,649.

**NEWARK**, the county seat of Licking Co., O., situated at the confluence of three forks of the Licking River, on the Ohio canal, about 33 mi. northeast of Columbus and within 14 mi. of the exact center of the state. The Pennsylvania and Baltimore and Ohio railroads, bus lines and an airport serve the city. Newark is on a level plateau surrounded by hills in which oil, sand and gas abound. The manu-

factures include stoves and furnaces, bottles, table glassware, rope and gasoline. In 1929 the value of the factory output was about \$21,600,000; the retail trade amounted to \$17,690,517. Among the agricultural interests are wheat, oats, hay, and dairy farming. Buckeye Lake, the largest inland resort of Ohio, attracts summer visitors to the city. Nearby are unusually interesting Indian mounds and also flint ridge quarries, from which primitive weapons and tools were obtained. Denison University is 6 mi. distant. Newark was founded about 1801 by a company of settlers from Newark, N.J., and was incorporated 25 years later. Pop. 1920, 26,718; 1930, 30,596.

**NEW ATLANTIS, THE**, in Francis Bacon's *New Atlantis*, 1626, an imaginary island in mid-Atlantic; called "New" as against Plato's Atlantis. Bacon, assuming that he has been wrecked on the shores of the island, finds there the ideal environment for carrying on his pursuit of learning. The book belongs to the class of imaginary commonwealths.

**NEW BEDFORD**, a port city in southeastern Massachusetts, one of the county seats of Bristol Co., situated on Buzzard's Bay and the Acushnet River, 56 mi. south of Boston. It is served by steamships, bus and truck lines and the New Haven Railroad. New Bedford is a center for the manufacture of fine cotton and silk products, being also a spot cotton market of importance. The total factory output for 1929 was worth \$121,692,217. The wholesale trade in 1929 amounted to \$23,458,819; the retail business to \$51,805,618. The traffic of the harbor in 1929 was valued at \$152,334,274. In the latter half of the 18th century New Bedford became a famous whaling center. The Bourne Whaling Museum is on Johnny Cake Hill, opposite the Seamen's Bethel, made famous in Herman Melville's *Moby Dick*. The whaling vessel, *Charles W. Morgan*, on exhibition a short distance from the city, is the last of over 600 American whalers that roamed the seas. Located here are the State Textile School, the New Bedford Vocational School and Swain Free School of Design. The site, originally a part of Dartmouth, was settled in 1652. New Bedford became a town in 1787, and was incorporated as a city in 1847. Pop. 1920, 121,217; 1930, 112,597.

**NEWBERG**, a town in Yamhill Co., northwestern Oregon. It is situated on the Willamette River, 24 mi. south of Portland; served by bus and truck lines and the Southern Pacific Railroad. Newberg is a trade center for a fruit and grain raising region. It was founded in 1875, incorporated in 1889, and is the seat of Pacific College (Quaker), attended by Herbert Hoover. Nearby is Champoe State Park. Pop. 1920, 2,566; 1930, 2,951.

**NEW BERN**, a port city and county seat of Craven Co., eastern North Carolina, situated at the junction of the Neuse and Trent rivers, 118 mi. southeast of Raleigh, N.C. Steamship lines, bus lines and two railroads serve the city. Livestock, tobacco and corn are among the principal crops. Lumber

# NEW BRUNSWICK



1. 4. COURTEST CANADIAN PACIFIC RAILWAYS; 2. 3. CANADIAN NATIONAL RAILWAYS

## ALONG THE RIVERS OF NEW BRUNSWICK

1. The large ice-free harbor of Saint John, owned by the Canadian Government.
2. Pulling in a 40-pound Atlantic salmon on the Restigouche River.
3. A log drive on the Nepisiquit River.
4. The famous "reversing falls" at Saint John.





and fertilizer manufacture and shipping are the chief industries. In 1929 the value of the manufactured output was about \$4,000,000; the retail trade amounted to \$6,527,181. New Bern was the first capital of North Carolina, founded in 1710. Pop. 1920, 12,198; 1930, 11,981.

**NEWBERRY**, a city and the county seat of Newberry Co. in western South Carolina, situated 43 mi. northwest of Columbia. Two railroads serve the city. It is a trade and manufacturing center for cotton and cotton products. The city is noted locally for its good schools; and it is the seat of Newberry College, established in 1859. Newberry was founded in 1830 and incorporated as a town in 1894. Pop. 1920, 5,894; 1930, 7,298.

**NEWBOLT, SIR HENRY JOHN** (1862- ), English poet, was born at Bilston, Staffordshire, June 6, 1862. He was educated at Oxford, later studied law and practiced in 1887-99. Thereafter he was chiefly occupied with editing and writing, and attracted favorable attention by the publication of his patriotic ballads *Admirals All*, 1897, and *The Island Race*, 1898. Among his other works are *Taken From the Enemy*, 1892, *Songs of the Sea and Songs of the Fleet*, and *A Naval History of the War, A New Study of English Poetry*, 1917, and *New Paths on Helicon*, 1927. Newbolt was knighted in 1915.

**NEWBORN, DISEASES OF.** See CHILDREN, DISEASES OF: Diseases of the Newborn, and Prenatal Diseases.

**NEW BOSTON**, a city in Scioto Co., southern Ohio, situated on the Ohio River, 3 mi. from Portsmouth. It is served by bus lines and three railroads. There is an airport. The city has several factories. In the vicinity are prehistoric mounds, a state forest and a game preserve. New Boston was incorporated in 1906. Pop. 1920, 4,817; 1930, 5,931.

**NEW BRAUNFELS**, a city and the county seat of Comal Co. in southern Texas, situated on the Comal and the Guadalupe rivers, 30 mi. northeast of San Antonio. A bus line and two railroads serve the city. Cotton, corn and grain are the chief local crops and livestock, especially dairy cattle, are raised. Limestone quarry-works, cotton milling, flour-milling and the manufacture of cotton-seed products comprise the principal industrial activities. The city was founded by Prince Solms of Germany in 1845 and the inhabitants are predominantly of German parentage. New Braunfels was the pioneer in organizing public free schools in Texas. Pop. 1920, 3,590; 1930, 6,242.

**NEW BRIGHTON**, a borough in Beaver Co., western Pennsylvania, situated on the Beaver River, 28 mi. northwest of Pittsburgh. It is served by two railroads. The river supplies abundant water power for the local manufactures which include nails, crankshafts, collapsible tubes, pottery and other products. Pop. 1920, 9,361; 1930, 9,950.

**NEW BRITAIN**, a city of central Connecticut, situated in Hartford Co., on the New York, New Haven & Hartford Railroad, about 11 mi. south-

west of Hartford. The city is an important manufacturing center. In 1929 the value of the manufactures, consisting mainly of hardware, household electrical appliances, bearings and cutlery, was about \$69,800,000; the retail trade for 1929 was about \$22,800,000. A state normal school is located here. New Britain was settled in 1687 as part of Farmington, but in 1785 became part of Berlin township. The township of New Britain was incorporated in 1850. In 1871 New Britain received a city charter. Pop. 1920, 59,316; 1930, 68,128.

**NEW BRUNSWICK**, a province of Canada bounded on the north by the province of Quebec and the Bay of Chaleur, on the east by the Gulf of St. Lawrence, on the south by the Bay of Fundy and on the west by the State of Maine. It is separated from Prince Edward Island by Northumberland Strait, and is joined to Nova Scotia by the isthmus of Chignecto. New Brunswick's length from north to south is 250 mi.; the greatest breadth is 190 mi. and coast line about 550 mi.

**Surface Features.** The province is a rolling country of slight elevation, a surface largely covered by timber which remains from an ancient forest of vast extent. Many lakes and rivers abound, the most important waterway being the St. John River, 450 mi. in length and remarkable for its fine scenery. It is navigable for 88 mi. to Fredericton and by small boats to Woodstock near the border of Maine. The Miramichi River flows in a northeasterly direction, draining the lowlands through forest regions for 200 mi. to enter Northumberland Strait. A smaller river, the Restigouche, curves round the northwest edge of the western highland to empty into the Bay of Fundy. The largest lake, Grand Lake, is 25 mi. long by about 5 mi. broad.

**Climate.** The temperatures are extreme but seldom severe; summer averages between 60° and 65° F. and winter between 15° and 25° F. The rainfall is about 42 in. Heavy snow falls in the north of the province. St. John's harbor is open throughout the year.

**Area and Population.** The area is 27,985 sq. mi. The population numbered 387,876 in 1921; 408,219 in 1931, and is a mixture of English and Irish, with an extensive settlement of French from Northumberland Strait to Chaleur Bay, three scattered Scottish groups and a few hundred Indians of Algonquin stock. The chief towns are St. John, Moncton, and Fredericton, the capital.

**Natural Resources.** Fishing is extensively carried on along the 600 mi. coast in the Bay of Fundy, and in the adjacent banks in the Gulf of St. Lawrence. Cod and halibut are obtained in large quantities. Lobster catching and canning is an important branch of the industry. Herring, sardines, salmon, mackerel and smelts are obtained by the many inshore fishermen.

Although the predominance of the lumber industry has tended to hinder agriculture, oats, hay and potatoes are extensively grown. The soil and climate are

favorable to the cultivation of fruit. Cheese and butter are produced in large quantities.

#### PRINCIPAL FIELD CROPS, NEW BRUNSWICK

1930 and Five-Year Average 1925-1929

Crop	Area	Yield per Acre	Total Yield	Total Value
	acres	bu.	bu.	\$
Oats ..... 1930	223,000	32.5	7,246,000	2,898,000
Av. .... 1925-29	211,848	28.4	6,017,100	4,277,800
Buckwheat ..... 1930	45,200	28.6	1,293,000	840,000
Av. .... 1925-29	44,504	22.8	1,016,180	911,800
		cwt.	cwt.	
Potatoes ..... 1930	48,000	121.9	5,853,000	3,804,000
Av. .... 1925-29	45,439	114.2	5,189,600	3,744,400
Turnips ..... 1930	13,600	220.0	2,992,000	898,000
Av. .... 1925-29	12,778	207.8	2,655,600	1,211,600
		tons	tons	
Hay and clover .... 1930	549,200	1.49	818,000	9,203,000
Av. .... 1925-29	555,515	1.44	802,200	8,924,600

New Brunswick is rich in forest resources. Of the 17,000,000 acres of forest land, the State owns about 7,000,000. The chief trees in the swamps are spruce, tamarac, balsam fir, northern white cedar, maple and black ash. There are forests of beech, hemlock, birch, maple and spruces on the higher ridges. The black spruce (*Picea mariana*) is the most valuable tree; great quantities are pulped for paper making. Annual lumber output is valued at over \$18,000,000, and the total value of forest products exceeded \$30,500,000 in 1926.

The mineral wealth of the province is not large. Coal and gypsum are actively mined. Bituminous coal is found in several districts, particularly in the Great Lake district about 25 mi. from Fredericton. Steam coal of good quality is located in the Minto Basin and gypsum deposits occur in Albert county. The bulk of the gypsum obtained is exported in a crude state to the United States. Natural gas with oil is obtained south of Moncton.

#### MINERAL PRODUCTION, NEW BRUNSWICK, 1929

Item	Production	Value \$	Rank Among Provinces
Coal ..... tons	218,706	909,169	5
Natural Gas . . M cu. ft.	678,456	333,002	3
Grindstones ..... tons	1,731	103,514	1
Gypsum ..... "	70,482	485,982	4
Clay products ..... "	160,006	160,006	8
Lime ..... tons	15,518	174,553	5
Stone ..... "	27,352	204,970	6
Other products ..... "	.....	67,876	—
Total all products	.....	2,439,072	8

**Education.** Primary education is state controlled, undenominational and free. Higher education is provided at a small provincial university at Fredericton, founded in 1800 and reestablished in 1859; at the University of St. Francis Xavier, Antigonish; Mount Allison University, Sackville; and at a college in St. Joseph.

**Acadians in New Brunswick.** The first census of 1671 showed that there were 75 families of Acadians,

441 persons, in the territory now known as New Brunswick and Nova Scotia. In 1686 there were 855 inhabitants. In 1755 it is estimated that there were almost 10,000. At least 7,000 were expelled and many of the remainder fled to Quebec and other places, yet they returned within 20 years. Since that time they have steadily increased in number and in spite of a large exodus to the United States they now number nearly one-third of the population of New Brunswick. In Nova Scotia the proportion of Acadians is very much smaller than in New Brunswick.

**History.** What is now New Brunswick was discovered by SEBASTIAN CABOT in 1498. It formed with Nova Scotia the French colony of Acadia from 1604 till 1713, and it is generally held that the colony was ceded by France to Britain in 1713 by the TREATY OF UTRECHT. The boundaries were not well-defined and there were disputes until 1763 when the TREATY OF PARIS guaranteed to Britain all of Canada with its dependencies. In 1784 New Brunswick was declared a separate province. After years of constitutional struggles the province entered the Dominion in 1867. The country was first colonized by British subjects in 1761, and in 1783 by American Loyalists from New England.

**NEW BRUNSWICK,** a city and the county seat of Middlesex Co., N.J., situated on ground rising sharply from the banks of the Raritan River, 35 mi. southwest of New York City. It is served by the Pennsylvania and the Raritan River railroads, motor bus lines, including those operating on the Lincoln and the "Super" highways, river steamers, barges on the Delaware and Raritan canals, and airplanes from Hadley field. **RUTGERS UNIVERSITY,** the New Jersey State College for Women and the Theological Seminary of the Reformed Church of America are located here. New Brunswick is an important manufacturing center and its industries, the varied products of which were valued approximately at \$53,000,000 in 1929, included the manufacturing of surgical and medical supplies, wall paper, automobile trucks, floor coverings, musical strings and bluing. The retail trade in 1929 amounted to \$24,197,470. One of the oldest cities in the United States, New Brunswick has a number of places of historic interest. The Anthony Dey mansion and the Queen's College building of Rutgers University are fine examples of Colonial architecture. New Brunswick was the headquarters of General Howe during the winter of 1776-77. Settled in 1681 it was chartered as a city under the crown in 1730 and was incorporated under the state legislature in 1884. Pop. 1920, 32,779; 1930, 34,555.

**NEW BRUNSWICK, UNIVERSITY OF,** at Fredericton, N.B., Canada, a coeducational and non-sectarian institution, incorporated as the College of New Brunswick in 1800. It was reincorporated in 1824 by Royal charter as King's College, and merged in 1859 in the University of New Brunswick established in that year. The buildings and grounds were valued in 1931 at \$1,000,000. There were 40,000 volumes in the library. In 1931-32 there were 380 stu-

dents, and a faculty of 15 headed by Chancellor CECIL C. JONES.

**NEWBURGH**, a city of Orange Co., southeastern New York, situated about 60 mi. north of New York City, on the west bank of the Hudson River opposite Beacon, with which it is connected by ferry. The Hudson widens at this point, forming Newburgh Bay, with a channel deep enough for ocean-going vessels. Two railroads, buses and trucks afford transportation. Newburgh rises in terrace formation above the river and offers vistas of river and Catskill Mountain scenery extending for miles, both north and south. The city has a large shipping trade in grain, flour, coal and dairy products. Its diversified manufactures include camel hair and llama cloth, men's clothing, overalls, lawn mowers, carpets, silk, yarns and laces. In 1929 the factory output was worth \$26,450,277. The retail business in 1929 reached a total of \$23,031,205. Newburgh was settled in 1709 by a band of Huguenot emigrants. Washington made it his headquarters in 1782-83. The house he occupied, built in 1750, still stands in Washington Park. Newburgh was incorporated as a village in 1800 and as a city in 1865. Pop. 1920, 30,366; 1930, 31,275.

**NEWBURYPORT**, a city and port of northeastern Massachusetts, one of the county seats of Essex Co., situated on the Merrimack River, about 35 miles northeast of Boston. The Boston and Maine Railroad, bus lines and steamers afford transportation. The output of Newburyport's diversified industries in 1929 was valued at \$13,082,572. In 1929 the retail business reached a total of \$8,888,039. Port commerce in 1929, consisting of incoming coal, gasoline, fuel oil and lumber, totaled 51,403 tons, valued at \$628,013. Until the Civil War Newburyport was a flourishing ship-building, whaling and fishing town. Its clipper ships were notably swift. In the 18th and 19th centuries many privateers were sent out from here. Newburyport, then a part of Newbury, was settled in 1635 by Reverend Thomas Parker, who came from Newbury, England. In 1764 it was incorporated as a separate town; with widened boundaries, it became a city in 1851. Newburyport is well-known for its old houses, chief of which is perhaps the Garrison House with stone walls several feet thick. The city is the birthplace of WILLIAM LLOYD GARRISON, the famous abolitionist. The Putnam Free School is located here, as is also one of the first high schools for girls established in America. Pop. 1920, 15,618; 1930, 15,084.

**NEW CALEDONIA**, an island of the South Pacific Ocean, a possession to France. It is 248 mi. long, has an average breadth of 31 mi. and covers an area of 8,548 sq. mi. Mountains rising to about 5,000 ft. above the sea dominate the surface. The island is rich in the variety of minerals. Cobalt, manganese, nickel and iron are found in profusion. The agricultural products include maize, tobacco, coffee, cotton, copra, pineapples and bananas. Cattle and sheep are reared in large numbers. With some dependencies, New Caledonia constitutes a French colony.

The capital and largest town is Noumea. In 1926 the total population was 51,876, including the 2,310 convicts in the penal settlement.

**NEWCASTLE, THOMAS PELHAM-HOLLES** (1693-1768), English minister of state, was born in 1693, probably in Sussex. He was one of the greatest landowners in the realm, and was created Duke of Newcastle in 1715. As secretary of state he held office for 30 years (1724-54), then became first lord of the treasury, or premier. After his resignation in 1756, he formed a coalition with Pitt, and again served as prime minister, 1757-62. He died Nov. 17, 1768.

**NEWCASTLE**, a seaport of New South Wales, Australia, situated on the eastern coast, about 100 mi. northeast of Sydney. The city has one of the best harbors in the world, being the chief coaling port of the South Seas. It is a well built modern city. The chief industrial establishments include copper foundries, shipbuilding yards, shoe and carriage factories. Newcastle is the see of a bishop of the Anglican Church. Pop. 1929, 104,640, with suburbs.

**NEW CASTLE**, a city in New Castle Co., northern Delaware, situated at the head of Delaware Bay, 5 mi. south of Wilmington. It is served by the Pennsylvania Railroad, ferries, buses and motor trucks. New Castle is a trade center in a grain and potato growing region, and has factories producing steel fiber and rayon. It was founded by the Swedes; Dutch settlers came in later in 1664 and the English took the city. WILLIAM PENN first set foot on American soil here in 1680. Until 1777 New Castle was the capital of Delaware. It became a city in 1875. Pop. 1920, 3,854; 1930, 4,131.

**NEW CASTLE**, a city of eastern Indiana, and county seat of Henry Co., on the Blue River, 43 mi. east of Indianapolis. Transportation is provided by three railroads. Trade is in the agricultural produce of the suburban territory and in diversified local industries. In 1929 the manufactures reached approximately \$15,000,000; the retail trade amounted to \$9,020,126. Roses are extensively cultivated. The Indiana Village for Epileptics is in the vicinity. Newcastle was founded in 1819, and incorporated in 1839. Pop. 1920, 14,458; 1930, 14,027.

**NEW CASTLE**, a city and county seat of Lawrence Co., Pa., 50 mi. northwest of Pittsburgh, on the Shenango River. It is served by the Baltimore and Ohio, the Buffalo, Rochester and Pittsburgh, the Erie, the Pennsylvania and the Pittsburgh and Lake Erie railways. The city is located in a fertile agricultural region having abundant deposits of iron, coal, limestone and clay. Manufactures include tin plate, steel, chinaware and other products. In 1929 the factory output reached approximately \$64,000,000; the retail trade amounted to \$26,281,890. Founded in 1802, New Castle became a borough in 1869 and a city six years later. Pop. 1920, 44,938; 1930, 48,674; 19% were foreign-born.

**NEWCASTLE-UNDER-LYME**, a market town in Staffordshire, England, forming a municipal and parliamentary borough, situated 2 mi. southwest of

**Hanley.** The town was named for its situation near a 12th-century castle, under the Forest of Lyme. Leather, malt liquors, paper, cotton and army clothing are the chief manufactures. The parish Church of St. Giles was restored in 1876 by Sir Gilbert Scott. Pop. 1921, 20,549; 1931, 23,246.

**NEWCASTLE-UPON-TYNE**, a city and river port of Northumberland Co., England, situated on the north bank of the Tyne, 272 mi. north of London. Situated in one of the largest coal districts in Britain, Newcastle exports large quantities of coal to all parts of the world. Owing to the rich mineral products of the district, the city has attained a prominent position among the great centers of British enterprise. Some of the more important industries are shipbuilding, the manufacture of locomotive and marine engines, ammunition, wire ropes, firebricks, anchors and sails.

The most noteworthy buildings are St. Nicholas and St. Mary cathedrals, the city hall, a handsome modern edifice, the castle, one of the finest specimens of castellated Norman in England, recently restored, and the public library. Among the educational institutions are the College of Medicine and Surgery and the College of Physical Science, in connection with Durham University.

Newcastle was a frequent object of attack in the wars between England and Scotland. In 1640 and 1644 it was taken by the Scottish Covenanting army, and in 1647 Charles I was handed over to the parliamentary commissioners. Pop. 1921, 275,009; 1931, 283,145.

**NEWCHANG.** See YINKOW.

**NEWCOMB, SIMON** (1835-1909), American astronomer, was born at Wallace, Nova Scotia, Mar. 12, 1835. After studying at Harvard he became professor of mathematics at the U.S. Naval Academy in 1861 and was appointed director of the Naval Observatory and the *Nautical Almanac*. He embarked upon the determination of all the fundamental constants of the planetary system on a uniform and homogeneous basis, and the calculation of tables for the positions of all the planets and the moon. In addition to these and other researches published largely in his *Scientific Papers Prepared for the American Ephemeris*, he was the author of popular books on astronomy. He received among other academic distinctions the Gold Medal of the Royal Astronomical Society in 1874, and the Copley Medal of the Royal Society in 1880. He died at Washington, D.C., July 11, 1909.

**NEW ECHOTA**, a national monument at Echota, Georgia, commemorating the site of a former capitol of the Cherokee Indians. The monument, having an area of one acre, was established May 28, 1930, under the administration of the War Department. It is reached by the North Carolina and St. Louis Railroad.

**NEW ENGLAND CONFEDERATION**, 1643-84, the first intercolonial federation in America. Fear of the Dutch to the west and of the Indians to the

north of the New England settlements prompted the subscribing, May-June, 1643, of the four colonies of Massachusetts Bay, Plymouth, Connecticut and New Haven to certain articles of union, providing for a firm and perpetual league of friendship. Eight commissioners, all church members, were to manage intercolonial affairs but not to interfere in the internal concerns of each colony; war expenses were to be mutually shared. Meetings were to rotate between the colonies. Although each colony elected two of the eight commissioners, those from Massachusetts, the largest colony, dominated the proceedings, and the bulk of the meetings were held in Massachusetts. The weakness of the league, in its authority to act only upon the colonies and not upon individuals, and the undue preponderance of Massachusetts, were responsible for its dissolution after the 36th meeting, Sept. 5, 1684.

**NEW FOREST**, a wooded district of 92,000 acres in southwest Hampshire, England. Bounded by the river Avon, the Solent and Southampton Water, New Forest has been a hunting ground for English kings since the days of the Saxons. William the Conqueror afforested the territory; to-day it is a national park. The Crown controls 16,000 acres, owners and tenants occupy one-fourth of the area, and the remainder is public ground, made up of woodlands, marshes and heaths. For hundreds of years forest laws administered by the Court of Verderers at Lyndhurst, the principal village, have governed this region. At Beaulieu are the ruins of a Cisterian Abbey founded by King John.

**NEWFOUNDLAND**, a large island of British America, not incorporated with the Dominion of Canada, situated on the Atlantic Ocean across the mouth of the St. Lawrence River.

**Area and Population.** Newfoundland is the tenth largest island in the world. Its greatest length, from Cape Ray on the southwest to Cape Norman on the north, is 317 mi.; its greatest breadth, from Cape Spear to Cape Anguille, is almost the same. The area is 42,000,000 sq. mi.; only a small percentage of this is occupied and improved. In 1931 the population was estimated at 271,685. The only inland settlements are at the mining town of Buchans and the paper mills at Grand Falls. St. John's is the capital, the principal commercial center and port, with a population in 1928 of 41,157; the other chief towns are Corner Brook, Grand Falls and Harbor Grace.

**Physical Character.** The island is irregular in shape with the general outline of a triangle. All along the coast are numerous bays and harbors. As a result, no portion of the island is more than 60 mi. from the sea. Several peninsulas jut out from the main structure: the Avalon Peninsula to the southeast; the Burin Peninsula between Placentia and Fortune bays; the Port-au-Port Peninsula on the west coast; the great northern peninsula, formerly the St. Barbe Peninsula. The general surface of Newfoundland is hilly but no marked elevations are reached. The mountain ranges extend north and south; the principal is the

Long Range Mountain, which begins at Cape Ray and continues northeast for 200 mi. Its highest peak is 2,000 ft. Of the rivers the largest is the Exploits River, 200 mi. long and draining an area of about 4,000 sq. mi.; the Gander, 100 mi. long, and its tributaries drain 3,000 sq. mi.; the Humber, on the west, passes through a picturesque and well-wooded country. The large inland bodies of water are Grand Lake, covering 192 sq. mi.; Red Indian Lake, 64 sq. mi.; Deer Lake, Gander, Gambo, Terra Nova and George IV lakes.

**Natural Resources.** Fishing is the industry upon which Newfoundlanders mainly depend for their livelihood. The cod fisheries are among the most abundant in the world and are found along the coast line, upon the Newfoundland Banks and near Labrador. The so-called banks lying south of Newfoundland are submarine plateaus which extend over a tract about 600 mi. long and 200 mi. broad. Sea, lobster, herring and salmon are plentiful near the colony and its dependency, Labrador.

Timber is chiefly found in the northern and western districts. There is an abundance of black spruce, fir and balsam, excellent for the pulp and paper industry which is a great source of revenue. Newsprint paper to a total value of \$13,600,000 was exported to the United States and Britain in 1928. The pulpwood reserves of the colony are estimated at 2,800 sq. mi. The total forest area is about 10,000 sq. mi.

Large deposits of iron occur on the east coast and are extensively worked and exported. In 1928 the export of hematite ore was: to Germany, 919,662 tons; to Nova Scotia, 530,632 tons; to the United States, 78,248 tons; and to Great Britain, 13,750 tons. Newfoundland has for many years been known to possess extensive areas bearing copper, lead, zinc and coal, but so far little exploratory work has been done at any distance from the coast.

**Communications.** Newfoundland is reached by way of the Canadian National Railways to North Sydney, N.S., thence by the Newfoundland Railway's steamer to Port-aux-Basques. There is also direct steamship service from Halifax, N.S. As Newfoundland is many hundreds of miles nearer Europe than any other part of North America, the first Atlantic cable was laid to the island in 1866. In 1901, Cabot Tower, St. John's, received the first transatlantic wireless message. The distance from the port of St. John's to the harbor of Valentia, Ireland, is about 1,918 mi.

**History.** Newfoundland is the oldest English colony. It was discovered by JOHN CABOT in 1497, occupied by Sir Humphrey Gilbert in 1583, colonized by the English from 1621, and after years of struggle for supremacy between English and French Newfoundland and its dependencies were declared by the TREATY OF UTRECHT in 1713 to belong to Britain. In 1855 responsible government was accorded the colony. It is administered by a governor, executive and legislative councils, and an elected House of Assembly. Newfoundland has steadfastly declined to join the Dominion of Canada.

**NEW GLASGOW**, a mining town in Pictou Co., Nova Scotia, Canada, situated on the East River, near its mouth in Pictou Harbor, 36 mi. northeast of Truro. Surrounded by an extensive coal region, New Glasgow has many industrial plants, including wheel foundries, woodworking factories, potteries, car, steel casting and rolling works, sawmills and door and sash factories. There also are several shipbuilding yards. Pop. 1921, 8,974; 1931, 8,858.

**NEW GUINEA**, also Papua, an island of the western Pacific lying just north of Australia, from which it is separated by the Torres Strait and the Arafura Sea. It is one of the largest islands of the Pacific, being about 1,500 mi. long, with an area of 300,000 sq. mi. The coast line is deeply indented with large gulfs and bays. Papua Gulf and Geelvink Bay are the major indentations. The interior, vast stretches of which are still unexplored, is a series of mountain ranges. The highest mountains, some of which have glaciers, are Mt. Idenburg and Mt. Carsten, the former rising to 15,000 and the latter to 16,000 ft. above the sea. The chief rivers of New Guinea are the Fly, the Digul, the Mamberamo and the Sepik. The Sepik is open to steam vessels for approximately 200 mi. from its mouth, and the Fly, which flows in a southwesterly direction and empties in the Gulf of Papua, is navigable for almost 600 mi.

New Guinea is divided in half (the boundary line running straight through the middle) between Holland and Great Britain, the Dutch part comprising an area of 157,789 sq. mi. of the total area of 300,000 sq. mi. About 100,000 sq. mi. of the British share, known as the territory of Papua, is under the jurisdiction of the governor-general of Australia. The remaining British part, comprising the northern section of the southwestern half of the island, once known as Kaiser Wilhelmsland, was mandated by the League of Nations in 1919 to the Commonwealth of Australia, being also under the authority of the governor-general of Australia. Madang and Rabaul are the chief towns of British New Guinea, which had an estimated population in 1929 of 460,869. The population of Dutch Guinea is estimated at 195,460 in 1920 and is almost entirely native, there being only a few hundred European and Eurasians. The natives live by hunting and fishing and on sago and coconuts, which are easily obtainable in the British section. In the northwest there are, however, 200,000 acres of land under cultivation and coffee, cocoa, kapok and various tropical fruits are grown.

**NEW HAMPSHIRE**, one of the original thirteen states of the Union, popularly called the "Granite State." It is situated between 42° 40' and 45° 18' N. lat. and 70° 37' and 72° 37' W. long. On the north it is bounded by the Canadian province of Quebec, on the east by Maine and by the



NEW HAMPSHIRE STATE SEAL

Atlantic Ocean, on the southeast and south by Massachusetts, on the west by Vermont from which it is separated by the Connecticut River, and by the province of Quebec. New Hampshire comprises an area of 9,341 sq. mi., inclusive of 310 sq. mi. of water surface. As to size New Hampshire ranks forty-third among the states of the Union.

**Surface Features.** New Hampshire is an eroded upland crossed at the north by a prong of the Appalachian Mountains locally known as the White Mountains. As a whole the state has a mean elevation of 1,000 ft. above sea level, and a relief varying from sea level to 6,293 ft. on the summit of Mt. Washington.

The White Mountains are an exceedingly rugged group due to glacial action which uncovered sharp ridges of rock and cut deep gorges in the slopes. The many lakes throughout the state, of which Lake Winnepesaukee is the largest, have beds scoured out by the ice sheet which also is responsible for the waterfalls and cascades of the rivers. Toward the southern boundary the rugged hills give way to low, rounded knolls composed of glacial drift in which gravel and boulders predominate.

The Merrimac and Connecticut rivers drain New Hampshire into the Atlantic Ocean. Along its eastern boundary are 15 mi. of tidal shore line.

**Climate.** Owing to its northern position the climate of New Hampshire is rigorous with long severe winters and in most districts, cool summers. At Concord, in the south central part of the state, the mean annual temperature is 45.5° F., ranging from a mean of 21.6° F. for January to 68.5° F. for July, with an annual precipitation of 37.5 in. including 60.8 in. of snow. The average date of the last killing frost at Concord is May 7 and that of the first killing frost in autumn is September 30, giving an average growing season of 146 days.

**Forests and Parks.** With the exception of the high mountain summits the entire land area of New Hampshire was originally covered with an unbroken forest of white pine, spruce, hemlock, oak, maple, chestnut, birch, beech and ash. A State Forest survey made in 1925-26 estimates the forest area including merchantable young growth and lightly stocked areas at 4,500,000 acres. Approximately 11% of the forests are owned by Federal and state governments, towns, societies and public institutions. The White Mountain National Forest which extends also into Maine has a net area in New Hampshire of 460,753 acres. A total of 59 state forests with an approximate area of 29,143 acres range in size from 3 acres to 5,925 acres in the Crawford Notch State Forest. Franconia Notch, 6,000 acres, forms New Hampshire's one state park. The Society for the Protection of New Hampshire Forests holds 12 forests totaling 3,338 acres as public trusts. The Appalachian Mountain Club which has also been given authority to acquire forest lands as public trusts has 13 parks in New Hampshire with a total area of 677 acres.

**Minerals and Mining.** The state's mineral resources, limited in the main to sand, gravel, clay and

granite deposits, are of minor commercial importance. With mineral productions in 1929 amounting to \$3,725,951, New Hampshire stood forty-third among the states, ranking second in feldspar, mica, and garnet abrasives. The principal products in order of value were sand and gravel, 1,976,781 tons valued at \$1,223,371; stone, 135,640 tons, \$1,153,465, including granite, \$706,259; clay products, \$900,388; feldspar, \$246,139; and mica, \$222,728. During 1929 39 mines and quarries gave employment to 643 persons who received \$883,457 in salaries and wages.

**Soil.** Throughout the entire state the soils are of glacial origin and very poorly adapted to the production of field crops. In the mountains and highlands, the disintegration of granitic gneiss has resulted in the formation of a coarse, sandy, sterile soil. There is relatively little shale, slate, limestone or other rocks which by decomposition contribute to soil fertility. Some valleys, however, possess fertile alluvial deposits, especially those of the Connecticut and Merrimac rivers, and are highly productive. In the southeastern part of the state there is a limited area of fairly fertile soil that has resulted from the decomposition of slate. Elsewhere in the district south of the mountains the surface soil is chiefly till or hardpan. This occurs in greatest thickness on the glacial hills known as drumlins.

**Agriculture.** Crop production is limited chiefly to hay, vegetables and fruits.

In 1930 1,960,061 ac. or 33.9% of the entire land area was in farms, 14,906 in number, with an average size per farm of 131.5 ac. and an average value per acre of \$39.47. Of the farm area 422,182 ac. was crop land; 932,624 ac., pasture land; and 495,599 ac., woodland. The total value of farm property was \$99,601,106, of which \$77,355,327 was represented by land and buildings; \$8,911,507, by implements and machinery; and \$13,334,272, by domestic animals.

According to the census of 1930 New Hampshire produced in 1929 field crops to the value of \$9,821,082, ranking forty-sixth among the states. The chief crops were hay and forage, 362,899 tons, \$4,900,989, chiefly timothy and clover; vegetables, \$3,046,569; fruits, \$1,327,222, and grains, \$246,773. The leading vegetables were potatoes, \$1,676,535, and sweet corn, \$187,172; the chief fruit crop was apples, 791,107 bu. Farm products sold by cooperative marketing rose from \$120,427 in 1919 to \$675,438 in 1929, and farm supplies purchased by this method from \$246,059 to \$1,113,317. Farm machinery and equipment in 1930 included 11,079 automobiles, 4,539 motor trucks, and 1,096 tractors.

**Animal Industry.** Dairying and poultry growing are the chief animal industries. According to the census of 1930, New Hampshire ranked forty-sixth among the states in total value, \$13,334,272, of domestic animals on farms. Among these were cattle, 135,827, valued at \$9,618,229; horses, 20,101, \$2,093,218; swine, 15,576, \$230,800, and sheep, 21,254, \$171,763.

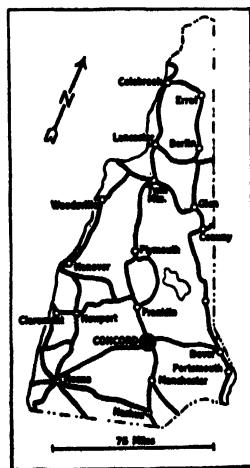
Of the cows on farms 84,996 were kept mainly for

milk production and 2,142 mainly for beef production. In 1929, 40,679,579 gals. of milk were produced; the total value of dairy products marketed, mostly whole milk, was \$9,097,094. The value of all poultry raised, chiefly chickens, was \$4,193,650; the chickens sold were valued at \$2,574,922. Of 8,536,619 doz. chicken eggs produced, valued at \$3,889,559, 6,928,108 doz., with a value of \$3,160,236, were marketed.

**Fisheries.** The fisheries of New Hampshire now fall far behind their former importance, the total catch for 1930 amounting to but 378,000 pounds, valued at \$52,000. Cod, haddock, mackerel and other Atlantic coast species are taken. Sportsmen find good fishing in the inland lakes and streams, and the state is earnestly endeavoring to keep the mountain trout streams stocked. In 1930, 74,526 licenses were issued to sportsmen for which \$130,780 was received in fees. Six fish hatcheries were operated by 17 men at a cost for the year of \$76,972. The 1930 output included 4,365,287 trout, 259,920 other game fish and 75,000,000 commercial species. The U.S. Bureau of Fisheries in 1930 distributed: 75,000 chinook salmon, 19,000 other salmon, 1,233,390 brook trout, 500,000 pike perch, 4,900,000 yellow perch and 16,000 bass.

**Transportation.** The first railroad transportation was introduced to New Hampshire by the Boston and Maine railroad, which operated a line between Dover and Boston, Mass., as early as 1842. This line still controls the greater part of the state's total railway mileage, reported as 1,166 in 1930. The Grand Trunk railway also operates a short line in the northern part of the state. Lack of navigable rivers, harbor facilities and its short coastline have made transportation by water negligible.

Its highways, however, have been well maintained and extended. On Jan. 1, 1930, there were 14,817 mi. of highways, including 2,784 mi. of surfaced roads and 2,289 mi. of improved state highways. Gasoline consumption during 1930 totaled 64,743,000 gals. The aggregate highway expenditure was \$9,755,167 in 1929, of which \$7,621,386 was paid by the state and \$2,133,781 by county and



NEW HAMPSHIRE STATE ROADS

local governments. The state gasoline tax produced an income of \$2,499,478 in 1930 as against \$768,582 in 1926. Total motor vehicle registrations in 1930 were 112,183 compared with 81,498 in 1925, an increase of about 50%. The rapid growth of transportation by truck is attested by the registrations, which rose from 9,026 in 1925 to 19,028 in 1930, or over 110%. During the same period, the number of buses in operation increased from 163 to 355, or about 120%.

**Manufactures.** Because of abundant water power, especially on the Merrimac River, proximity to the most populous section of New England and good transportation facilities New Hampshire has long possessed substantial manufactures.

According to the Census of 1930 New Hampshire with manufactures for 1929 valued at \$332,534,753 stood thirty-third among the states. Its 1,075 establishments gave employment to 5,722 officers and employees, who received \$14,732,103 in salaries, and to 65,511 wage earners, who were paid \$70,513,919 in wages. These factories used a total of 402,147 horse power, expended \$8,668,727 for fuel and power, and \$176,733,596 for materials and supplies, and added by the process of manufacture \$147,132,430 to the value of their output.

In this output there were 40 separately enumerated groups of manufactures, the state ranking fourth in wood pulp, fifth in boots and shoes and woolen goods, and seventh in cotton goods. In order of value the leading manufactures were boots and shoes, \$66,722,194; cotton goods, \$48,850,398; paper, \$22,483,315; wood pulp, \$20,418,031, and woolen goods, \$18,688,433. These products comprised 53% of the state's entire factory output.

The chief manufacturing cities with the amount of their products were Manchester, \$85,802,651; Nashua, \$43,607,560, and Berlin, \$35,813,351.

**Commerce.** According to the census of 1930, there were in 1929 326 wholesaling establishments in New Hampshire, with total sales of \$61,413,714. These organizations gave full-time employment to 2,455 men and women whose annual salaries and wages aggregated \$3,691,813.

The total sales of the 6,514 retail stores amounted to \$181,500,859. Sales per store averaged \$27,867; sales per capita were \$390.08.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Food .....	1,988	\$51,259,934	28.23
Automotive .....	1,282	37,451,577	20.61
General Mdse. ....	652	25,324,329	13.98
Lumber & Bldg. ....	269	13,798,913	7.60
Apparel .....	587	13,058,460	7.21
Furn. & Household ..	213	6,382,319	3.51
All other stores .....	523	34,225,327	18.86
Total, all stores....	5,514	\$181,500,859	100.00

**Finance and Banking.** The assessed value of all taxable property in 1930 was \$676,031,023. The general state bonded debt was \$5,442,500. Total state revenues for the year ended June 30, 1929 were \$17,078,619. The main sources of income were motor vehicle and gasoline taxes, general property taxes and railroad taxes. The total disbursements were \$16,514,696. The principal payments were for highway construction and maintenance, public schools, institutions and the University of New Hampshire.

There were 121 banks in New Hampshire in 1930. Of these, 54 were national banks and 67 state banks and trust companies. Their total capitalization was

\$7,441,811; their surplus and undivided profits, \$32,985,000. Total resources were \$325,946,000, with loans and discounts aggregating \$150,806,000. Demand and time deposits totaled \$269,030,000. Per capita demand and time deposits were \$578.56; per capita savings deposits, \$484.99. The total savings of \$225,520,000 were owned by 369,916 depositors. National bank circulation aggregated \$4,798,000.

**Government.** The legislative body of New Hampshire consists of a Senate composed of 24 members and a House of Representatives of 404 members, all elected for terms of two years, meeting in biennial sessions, unlimited in duration. The chief executive is the governor elected for terms of two years at a salary of \$3,000 per annum. Other executive officers chosen by joint ballot of the representatives are secretary, treasurer, and commissary general. Judicial power is vested in a supreme court, a superior court, and inferior courts. The supreme court consists of 5 judges chosen by the governor and his council for terms to last until the incumbent is 70 years of age at salaries of \$6,000 per annum.

**Social Welfare Institutions.** There is a state industrial school for juveniles and women at Manchester and a school for feeble-minded children at Laconia. A tuberculosis sanitarium is located at Glenclyff, in the town of Warren. The hospital for insane and the state prison are at Concord and at Tilton is a soldiers' home. The counties have almshouses and houses of correction. Aid is given by the state to the blind and deaf in institutions outside the state.

**Education.** The first schools were opened while New Hampshire was still a part of Massachusetts. Parmount and Maud, Boston's first teachers, settled in New Hampshire at Exeter and Dover. In 1649 John Legat taught at Hampton. A general school law was passed when New Hampshire became an independent state in 1680. By 1928 there were 2,057 public elementary schools, having 2,221 teachers and 75,399 enrolled pupils. The 89 public high schools had 697 teachers and 12,989 pupils. Children from 8 to 14 years of age are required by law to attend school the full term.

The number of persons from 5 to 20 years of age attending school in 1930 was 95,254, or 72.2% of the population within the ages specified, as compared with 80,127, or 66.4%, in 1920. The number of persons 10 years and over unable to read and write in 1930 was 10,231, or 2.7%, as compared to 15,788, or 4.4%, in 1920. Foreign-born white illiterates numbered 7,820, or 9.6%, in 1930, and 13,746, or 15.4% in 1920.

Among the institutions of higher learning, the state maintains the University of New Hampshire and normal schools at Plymouth and Keene. Others are Dartmouth College at Hanover and St. Anselm's College at Manchester. The New Hampshire Public Library Commission has headquarters at Concord.

**Population.** In 1930 New Hampshire ranked forty-first among the states with a population of 465,293 or an average of 51.5 per sq. mi., an increase of

22,210 or 5% over 1920. The population rose from 141,885 in 1790 to 317,976 in 1850, 411,588 in 1900, 430,572 in 1910, and 443,083 in 1920. In 1930 there were 464,350 or 99.8% whites and 790 or 0.2% Negroes. Of the whites 381,690 were native-born and 82,660 were foreign-born. Of the total foreign stock, including foreign-born, and foreign and mixed parentage, 101,324 or 45.1% were Canadian French and 36,094 or 16% other Canadians. The urban population was 273,079 or 58.7% of the total, a decrease of 6,682 or 2.4% from 1920; the rural population was 192,214 or 41.3% of the total, an increase of 28,892 or 17.7% since 1920. In 1930 the five largest cities were Manchester, 76,834; Nashua, 31,463; Concord, 25,228; Berlin, 20,018; Portsmouth, 14,495.

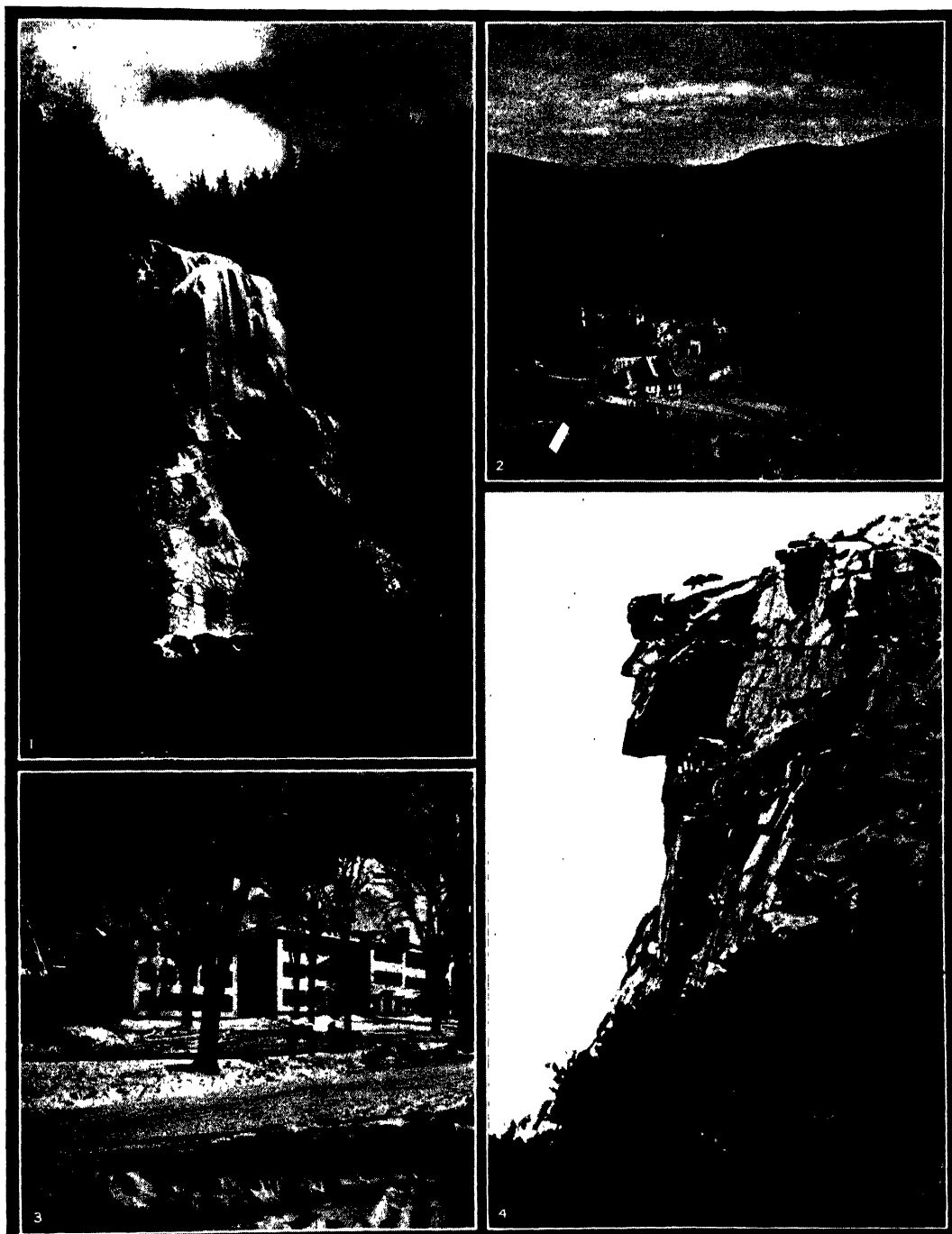
**Occupations.** In 1930 192,666 persons, or 41.4% of the population, were gainful workers 10 years old or older; 74.1% of these were males and 25.9% were females; 75.6% were native white, and 24.0% foreign-born white. Among the chief occupations, with number of workers, were manufacturing, 89,303; agriculture, 22,067; trade, 19,515; domestic and personal service, 18,204; transportation and communication, 14,413; professional service, 12,736, and clerical service, 10,683.

## HISTORY

Martin Pring in 1603 explored the New England coast from Cape Cod to Casco Bay. CHAMPLAIN sailed along the New Hampshire shore in 1605. JOHN SMITH made detailed observations in 1614. The Council for New England, including Sir FERNANDO GORGES and his associates, received from James I in 1620 a grant of the country between latitudes 40° and 48°, and let several colonizing and trading concessions to portions of the present New Hampshire. The first of these was made to John Mason, Mar. 9, 1622, the territory between the Piscataqua and Merrimac rivers. In 1623 David Thompson founded a settlement at the site of Rye, and Dover Point was settled by Edward Hilton; Portsmouth was colonized by the Lygonia Company in 1630. John Wheelwright, a religious exile from MASSACHUSETTS Bay Colony, founded Exeter, and other Puritan colonists whose motive was land-hunger settled Hampton in 1638. Massachusetts, interpreting its chartered boundaries very broadly, claimed hegemony over the region, and by 1644 the hitherto practically independent towns were united with Massachusetts Bay. Mason's grandson ultimately secured a decision in the British courts declaring the action of Massachusetts a usurpation; on Sept. 18, 1679, New Hampshire was constituted a royal province. John Cutt was the first president, and Portsmouth was the first capital. After the consolidated government of the northern colonies under SIR EDMUND ANDROS, 1686-1689, collapsed, the New Hampshire towns attempted ineffectually to re-establish a provincial government, and then entered a union with Massachusetts. Royal government was re-established in 1692, and connection with Massachusetts ceased, except that from



## NEW HAMPSHIRE



1, 2, DANIEL STEVENS PHOTO. COURTESY NEW HAMPSHIRE DEVELOPMENT COMM.; 3, PAUL J. WEBER PHOTO; 4, B. P. ATKINSON PHOTO

### MOUNTAIN SCENES AND THE STATE'S OLDEST COLLEGE, NEW HAMPSHIRE

1. Beaver Falls at Colebrook. 2. Large hotel overlooking Lake Gloriette, Dixville Notch, Dixville, New Hampshire. 3. Old Dartmouth Row, historic buildings of Dartmouth

College, Hanover. 4. The famous "Old Man of the Mountains" at Franconia Notch in the White Mountains, seen by thousands of tourists yearly.







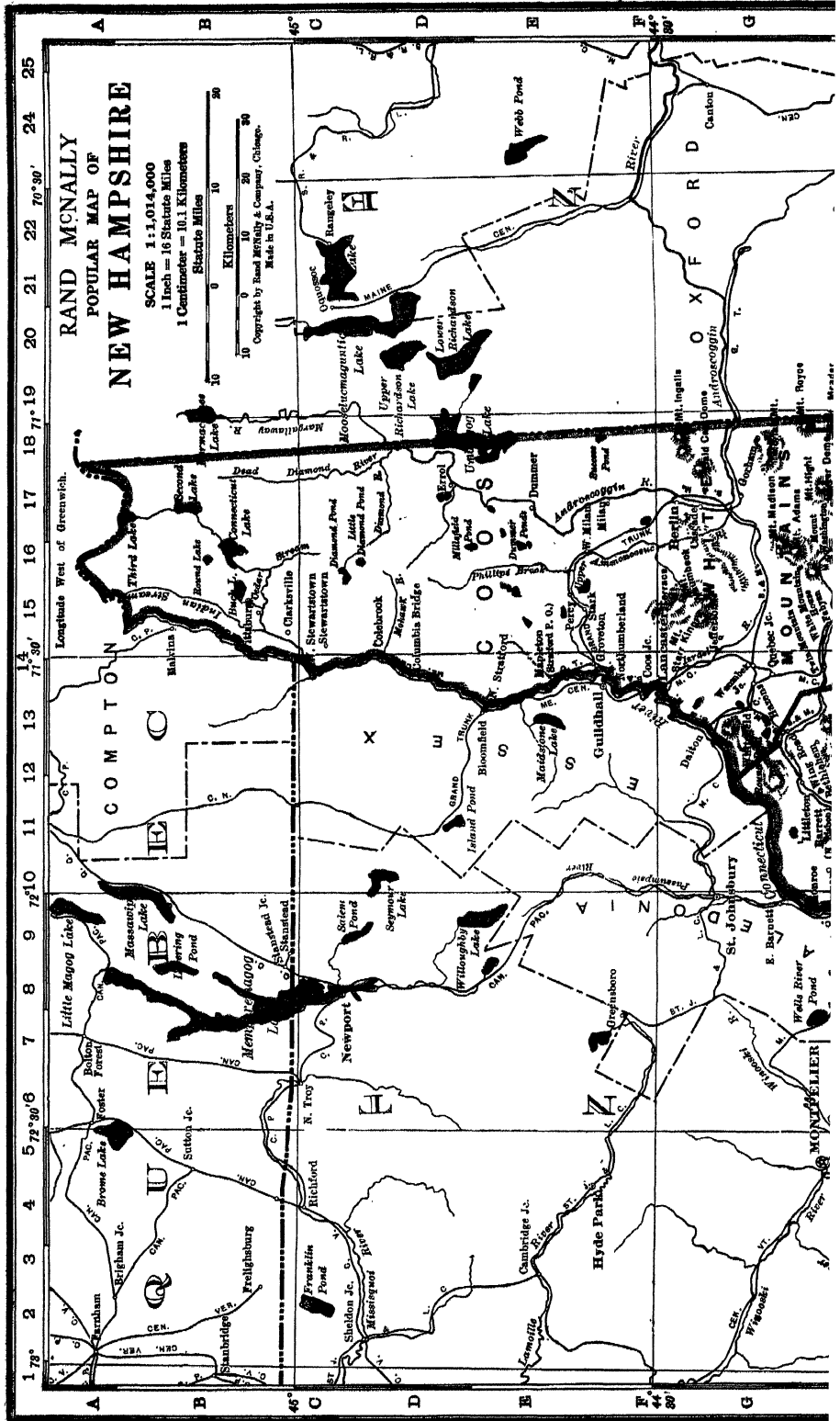
# NEW HAMPSHIRE

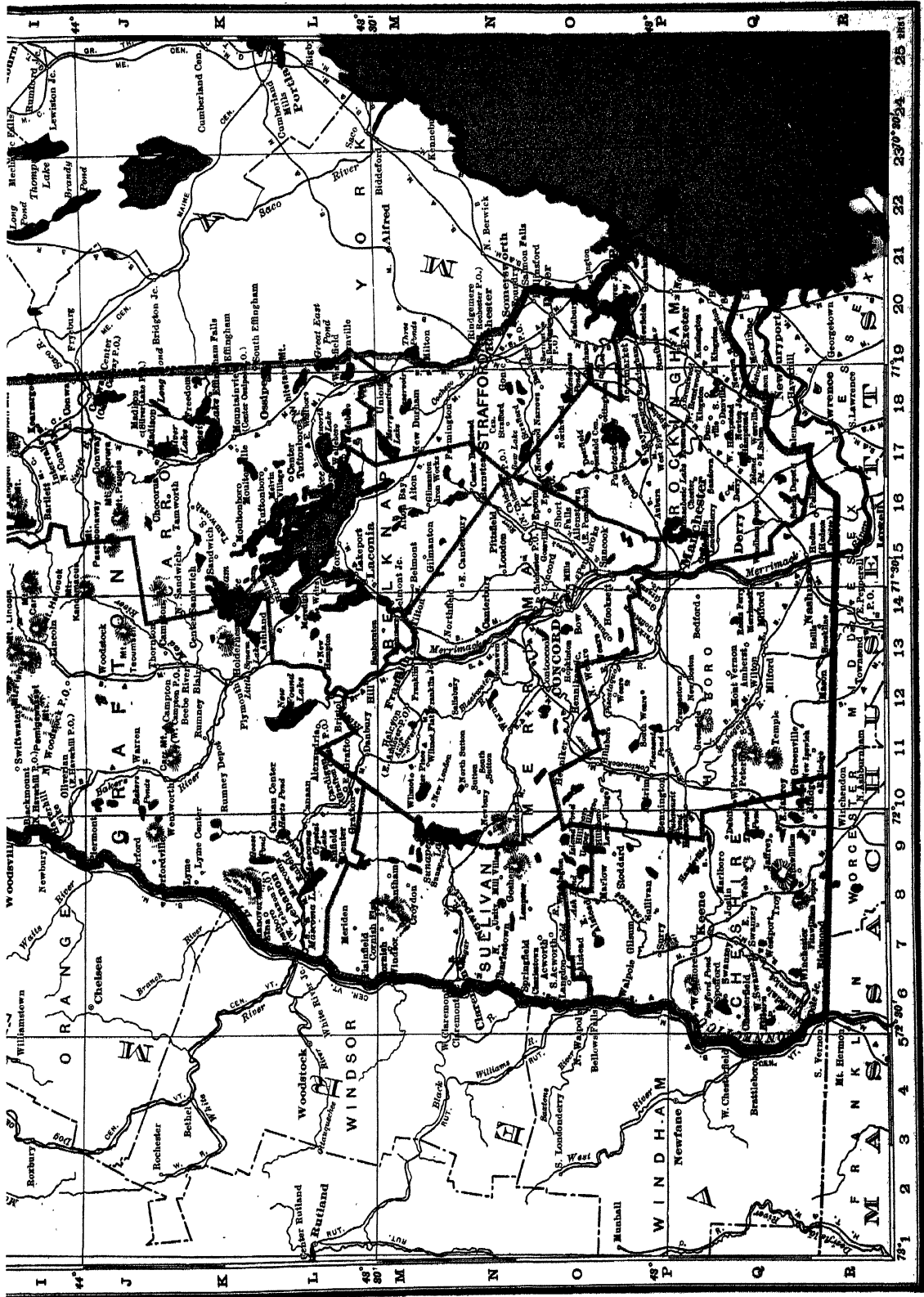
Area 9,341 sq. m.  
Pop. 465,293

## PRINCIPAL CITIES

### Pop.—Thousands

1	Allenstown	O	15
2	Alton	M	17
1	Amherst	M	13
1	Andover	M	11
1	Antrim	P	11
1	Ashland	K	13
1	Bartlett	L	16
1	Bedford	P	14
1	Beebe River	J	13
1	Belmont	M	14
20	Berlin	F	17
1	Boscawen	N	13
1	Bristol	L	12
1	Campton	J	13
1	Canaan	L	10
2	Charlestown	N	6
12	Claremont	N	6
2	Colebrook	D	14
25	Concord	O	14
3	Conway	J	18
5	Derry	O	16
14	Dover	O	20
1	Durham	J	10
2	E. Jaffrey	C	10
3	East Pembroke	O	15
1	Enfield	L	8
2	Epping	P	19
5	Exeter	P	19
3	Farmington	N	18
7	Franklin	M	13
4	Goldstown	G	13
3	Gorham	G	12
1	Greenville	R	12
1	Groveton	F	14
2	Hampton	P	20
1	Hanover	K	17
4	Haverhill	O	10
1	Henniker	O	11
2	Hillsboro	O	11
2	Hinsdale	O	5
2	Hooksett	O	14
1	Hopkinton	O	15
3	Hudson	R	13
13	Jaffrey	C	9
14	Keene	P	7
1	Kingston	P	18
13	Laconia	M	15
3	Lancaster	M	14
7	Lebanon	L	8
2	Lincoln	I	13
2	Lisbon	H	11
5	Littleton	C	12
1	Londonderry	C	15
77	Manchester	P	15
2	Marlboro	O	8
2	Meredith	L	14
1	Merrimack	O	14
4	Milford	O	13
1	Milton	M	19
32	Nashua	R	15
3	New Market	P	19
5	Newport	N	8
1	Northfield	M	13
2	Northumberland	T	14
1	N. Walpole	O	6
1	Ossipee	K	13
3	Pembroke	O	1
3	Pembroke	O	15
3	Peterboro	C	10
2	Pittsfield	N	16
1	Plaistow	C	18
3	Plymouth	K	12
15	Portsmouth	N	20
1	Raymond	O	21
10	Rochester	N	19
1	Rollinsford	N	20
1	Rye	P	21
3	Salem	C	17
1	Salem Depot	C	17
2	Salmon Falls	N	20
2	Seabrook	C	20
6	Somersworth	N	20
1	Stewartstown	C	14
1	Sunapee	M	9
1	Suncook	O	16
2	Swanzey	O	7
2	Tamworth	K	16
1	Tilton	M	13
1	Troy	O	8
1	Wakefield	L	19
1	Walpole	P	11
1	Warner	N	11
1	Weare	O	12
2	W. Lebanon	L	7
2	Whitefield	G	18
1	Wilton	C	13
3	Winchester	R	8
3	Wolfeboro	L	17
1	Woodsville	I	10







1699 to 1741 the same governor was appointed to both provinces. Acrimonious boundary disputes with Massachusetts were settled in 1741 when the Crown fixed a southern boundary very favorable to New Hampshire. From 1749 to 1764, when a royal order named the western bank of the Connecticut, the western boundary was under dispute with New York.

The loyal governor, John Wentworth, was banished in 1775, as New Hampshire, probably with less Tory dissent than any other colony, moved toward independence. The population was then about 80,000. A state government was established at Exeter, Jan. 5, 1777, where the legislature met regularly at Concord. New Hampshire was the ninth state to ratify the federal Constitution (June 21, 1788), the document by this act becoming organic law. The state was at first Federalist in political leanings, but from 1815-55, with the exception of one state election, was consistently Democratic. The famous DARTMOUTH CASE was an outcome of this partisan shift. A KNOW-NOTHING governor was elected in 1856. The Republican party has since dominated politics in New Hampshire, with the exception of four state elections and the Presidential election of 1916, when Wilson was successful. Strong reform sentiment which, expressed in the issues of slavery and prohibition, had broken up the Democratic party in the state in the 1850's, has remained a political force. In 1932 Hoover carried the state. Fred H. Brown, Democrat, was elected senator and John G. Winant, Republican, was reelected governor.

**BIBLIOGRAPHY.**—F. B. Sanborn, *New Hampshire, an Epitome of Popular Government*, 1904; E. S. Stackpole, *History of New Hampshire*, 1916-18.

**NEW HAMPSHIRE, UNIVERSITY OF**, at Durham, N.H., a coeducational state institution, founded at Hanover in 1866 as the New Hampshire College of Agriculture and Mechanic Arts, in connection with Dartmouth College. It was moved to Durham in 1893, as a result of a gift of 200 acres of land and \$800,000, the bequest of Benjamin Thompson. In 1923 the college became the University of New Hampshire. It had productive funds totaling \$1,338,239 in 1931. The library contained 70,311 volumes. In 1931-32 there were 1,662 students, and a faculty of 158 headed by Pres. Edward M. Lewis.

**NEW HAVEN**, a port city in southwestern Connecticut, the county seat of New Haven Co., situated on Long Island Sound, 72 mi. northeast of New York City. Bus and truck lines, steamships, airplanes and the New Haven Railroad afford transportation. New Haven is an educational and industrial center. The principal manufactures are hardware, car and railroad shop products, corsets, machinery, wire goods, cigars, guns, ammunition, clothing, clocks, watches, toys, paper boxes, rubber goods and furniture. The factory output, 1929, was worth \$135,894,115. The wholesale trade, 1929, amounted to \$75,889,807; the retail business to \$114,487,649. The commerce of the harbor, 1929, was valued at \$153,360,866. The city is built around a green on which stand three famous

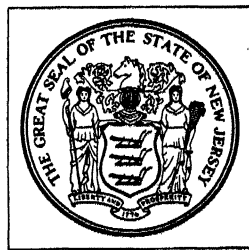
churches: Trinity, the United and the Center. Several of the buildings of YALE UNIVERSITY face the green, from which the beautiful Harkness Memorial Tower is visible. New Haven is the seat also of the State Normal School, Connecticut College of Pharmacy, Arnold College of Hygiene and Physical Education, New Haven College and Albertus Magnus College. The city was founded in 1638; chartered in 1784. Pop. 1920, 162,537; 1930, 162,655.

**NEW HEBRIDES**, a group of islands of the Pacific Ocean, lying between the Fiji Islands and New Caledonia. They are mostly mountainous, partly of volcanic origin, and are covered with thick vegetation. The total area is 5,700 sq. mi. and the largest among them are Marina, Annatom, Aurora, Ambrim and Epi. The principal products are cotton, cocoa, coffee, maize and vanilla. The port of Vila, on Efate island, is the capital. The New Hebrides are administered jointly by France and Great Britain. The population of the larger islands is about 60,000.

**NEW IBERIA**, a port city in southern Louisiana, the parish seat of Iberia parish, situated on Bayou Teche, 125 mi. west of New Orleans. Two railroads and river craft serve the city which is a shipping center for sugar, rice, corn and cotton. The chief industries include paper mills and canneries. There are three large rock salt deposits in the vicinity. Settled by the Acadians, made famous in Longfellow's *Evangeline*, New Iberia was laid out in 1835 and chartered in 1839. JOSEPH JEFFERSON lived on Jefferson's Island. Pop. 1920, 6,278; 1930, 8,003.

**NEW JERSEY**, a middle Atlantic state, one of the original thirteen states of the United States, popularly called the "Garden State." It is situated between 38° 56' and 41° 21' N. lat. and 73° 54' and 75° 35' W. long. The state is bounded on the north by New York and on the east by New York, from which it is separated by the Hudson River, and by the Atlantic Ocean; it is bounded on the south and west by Delaware and Pennsylvania from which it is separated by Delaware Bay and the Delaware River. New Jersey comprises an area of 8,224 sq. mi., inclusive of 710 sq. mi. of water surface. In size New Jersey ranks forty-fifth among the states of the Union.

**Surface Features.** New Jersey may be divided topographically into two sections separated by a line drawn from Trenton to Raritan Bay. North of this line are highlands composed of low ridges belonging to the Appalachian mountain system. The Kittatinny Mountains comprise the northwestern boundary, and the Schooley range lies southeast of them across the Kittatinny valley. The latter range continues as the Ramapo Mountains northeastward into New York state where it forms the Hudson high-



NEW JERSEY STATE SEAL



lands. These ridges reach their maximum height of 1,805 ft. in Sussex Co. The mean elevation of the entire state is 250 ft. above sea level.

The southern three-fifths of New Jersey is a sandy level which marks the beginning of the Atlantic Coastal Plain. Its shore line of 392 mi. has many small indentations and is parallel on the Atlantic side by off-shore barrier beaches which are sites of many seashore resorts. Small tributaries of the Delaware River drain the northern section of the state, and the coastal plain is cut by numerous creeks which reach the Atlantic Ocean.

**Climate.** The climate is varied. The mean annual temperature is 51.4° F., ranging from 49.2° F., with an average of 28° F. for winter and 70° F. for summer, in the highland area of the north to 52.3° F., with an average of 32.5° F. for January and 72.1° F. for July, at Atlantic City in the extreme south. During the period 1885-1930 the highest temperature recorded in New Jersey was 109° F. and the lowest -34° F. The average annual precipitation is 45.9 in. At Atlantic City, due to its proximity to the ocean, the average growing season is 208 days, while at Dover in the northwest it is about 137 days.

**Forests and Parks.** The original forests of New Jersey which covered approximately 90% of the land area have been entirely cut over. The second-growth forests, in a 1931 estimate, cover approximately 40%. In the northwestern region which includes the Kittatinny Mountains and the Palisades of the Hudson the principal trees are hardwoods, oak, chestnut, maple, hickory, birch, tulip, gum and elm with a very few evergreens. The central southeastern forest region covers approximately 1,240,000 acres of which one-half is short leaf pine, a fourth oak and other hardwoods and the remaining area is burned-over and brush lands and southern white cedar swamps. Eight state-owned forests on July 1, 1931 had an area of 37,275 acres. All have transient camping sites with sanitary facilities and permanent camp sites which may be leased. Two state game sanctuaries have a total area of 248 acres. One is principally for the propagation of game animals; the other is a sea bird sanctuary. New Jersey's six state parks with a total area of 13,574 acres include HIGH POINT PARK, WASHINGTON CROSSING, and PALISADES INTERSTATE PARK. Parvin Park in southern New Jersey is a 1,000-acre region with a large lake, a section of old cedar swamp and excellent woodlands.

**Minerals and Mining.** The most important of the mineral resources of New Jersey are its large and varied clay deposits utilized extensively in the production of brick, tile, terra cotta and pottery, of which the state is a leading producer. Next in importance are the great zinc ore deposits in the Franklin Furnace district, still highly productive in 1930 after about 80 years of mining. Of high commercial value also are the numerous sand and gravel deposits and trap rock quarries. Iron ore, said to have been smelted at Shrewsbury as early as 1674, is still mined in substantial quantities.

With mineral productions in 1929 amounting to \$71,891,861, New Jersey stood eighteenth among the states, ranking second in zinc and third in clay products. Of leading importance were clay products valued at \$39,417,968; zinc, 103,740 tons, about \$13,500,000; sand and gravel, 6,721,498 tons, \$5,585,285; basalt or trap rock, \$3,580,184; iron ore, \$1,161,159; and limestone, \$1,013,315. Among minor products were molding sand, silica, glass sand and greensand marl.

During 1929 138 mines and quarries gave employment to 4,223 persons who received \$6,877,397 in salaries and wages.

**Soil.** In the northern highlands and in parts of the central section glacial drift deposits prevail. The most productive soils are found in the Piedmont district. These consist of a rich loam, chiefly composed of clays, and marls. In the coastal plain district the soil is generally sandy and infertile, except in some low areas where there are deposits of alluvium.

**Agriculture.** Vegetables and fruits comprise more than half the value of all crops produced.

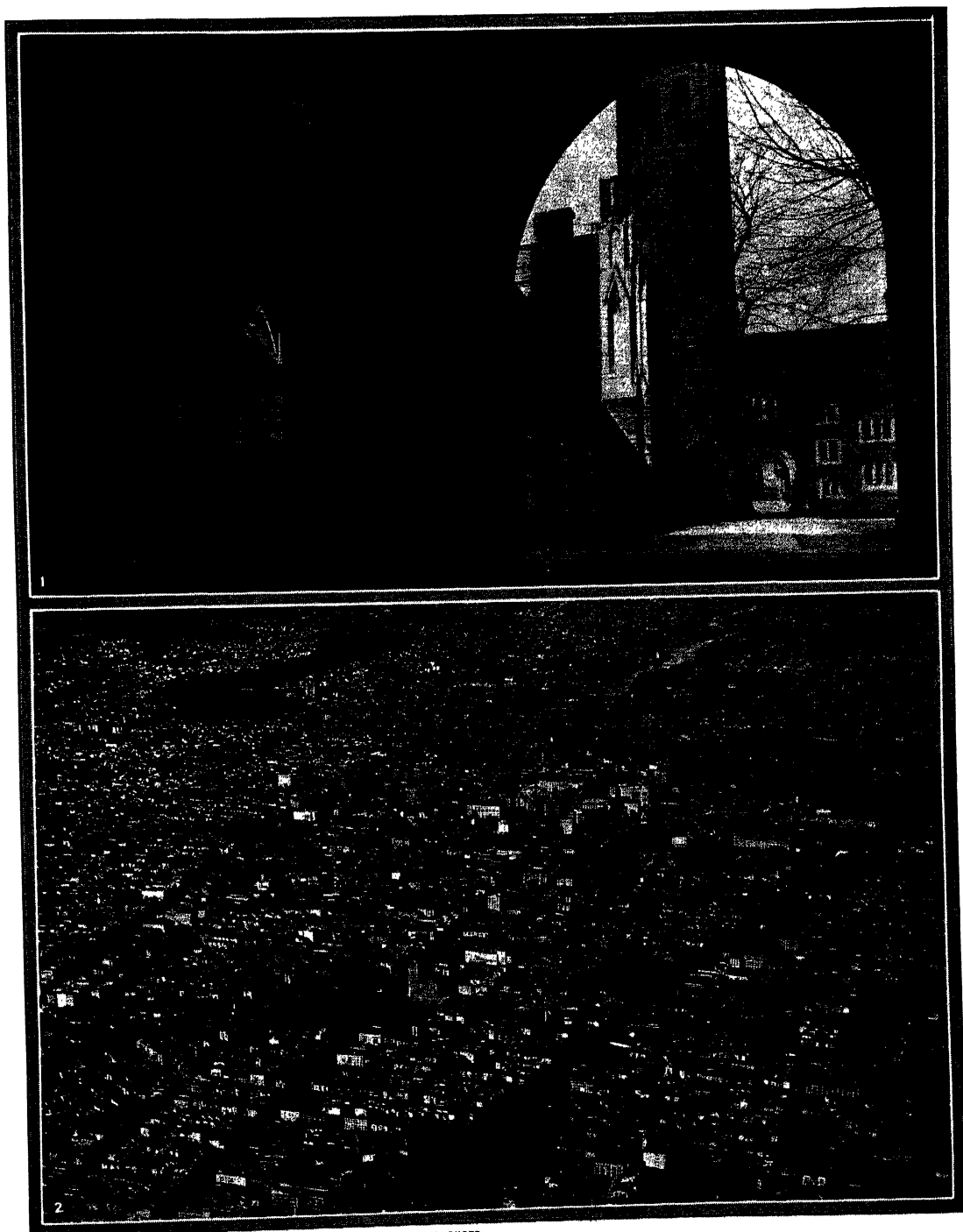
In 1930 1,758,027 ac. or 36.6% of the entire land area was in farms, 25,378 in number, with an average size per farm of 69.3 ac. and an average value per acre of \$169.99. Of the farm area 987,315 ac. was crop land; 339,607 ac., pasture land; and 232,316 ac., woodland. The total value of farm property was \$355,387,510, of which \$298,845,113 was represented by land and buildings; \$27,076,085, by implements and machinery; and \$29,466,312, by domestic animals.

According to the census of 1930 New Jersey produced in 1929 field crops to the value of \$52,363,197, ranking thirty-sixth among the states. It stood first in tomatoes, second in asparagus, fourth in sweet corn, fifth in beans and lettuce, sixth in celery, and fourth in all vegetables harvested for sale; it also ranked second in cranberries, fourth in blackberries and fifth in peaches. The chief crops were vegetables, \$29,205,854; fruits, \$8,245,444; grains, \$7,495,287, and hay and forage, 327,062 tons, \$7,415,277. Among the vegetables were potatoes valued at \$7,573,632; tomatoes, \$5,802,896; sweet potatoes, \$2,098,319; asparagus, \$1,691,678; sweet corn, \$1,596,164; beans, \$1,128,281; lettuce, \$701,647; spinach, \$685,027; celery, \$656,830; peppers, \$626,669, and cabbages, \$562,351. The chief fruits were apples 2,148,886 bu., peaches 1,989,679 bu., strawberries 6,545,305 qts., cranberries 3,640,273 qts., blackberries and dewberries 2,810,468 qts., and raspberries 1,002,597 qts. The grains included corn 4,978,926 bu., wheat 1,100,937 bu., oats 815,609 bu., and rye 518,520 bu.

Farm products sold by cooperative marketing dropped from \$6,603,253 in 1919 to \$5,271,712 in 1929, and farm supplies purchased by this method from \$2,093,705 to \$1,785,290. Farm machinery and equipment in 1930 included 22,371 automobiles, 14,753 motor trucks, 8,088 tractors, 5,879 electric motors, and 9,036 stationary gas engines.

**Animal Industry.** Dairying and poultry keeping are the chief livestock interests. According to the census of 1930, New Jersey ranked fortieth among

## NEW JERSEY



1. COURTESY PRINCETON UNIVERSITY; 2. PUBLISHERS' PHOTO SERVICE PHOTO

### NEW JERSEY'S LEADING UNIVERSITY AND CHIEF CITY

1. Court of Holder Hall, Princeton University, Princeton, New Jersey. 2. Air view of Newark, cut by Broad Street, Orchard Street and Mulberry Avenue in the center. In the

right background is the central business section and the Passaic River, and in the left background Branch Brook Park. Military Park is at the head of Broad Street.





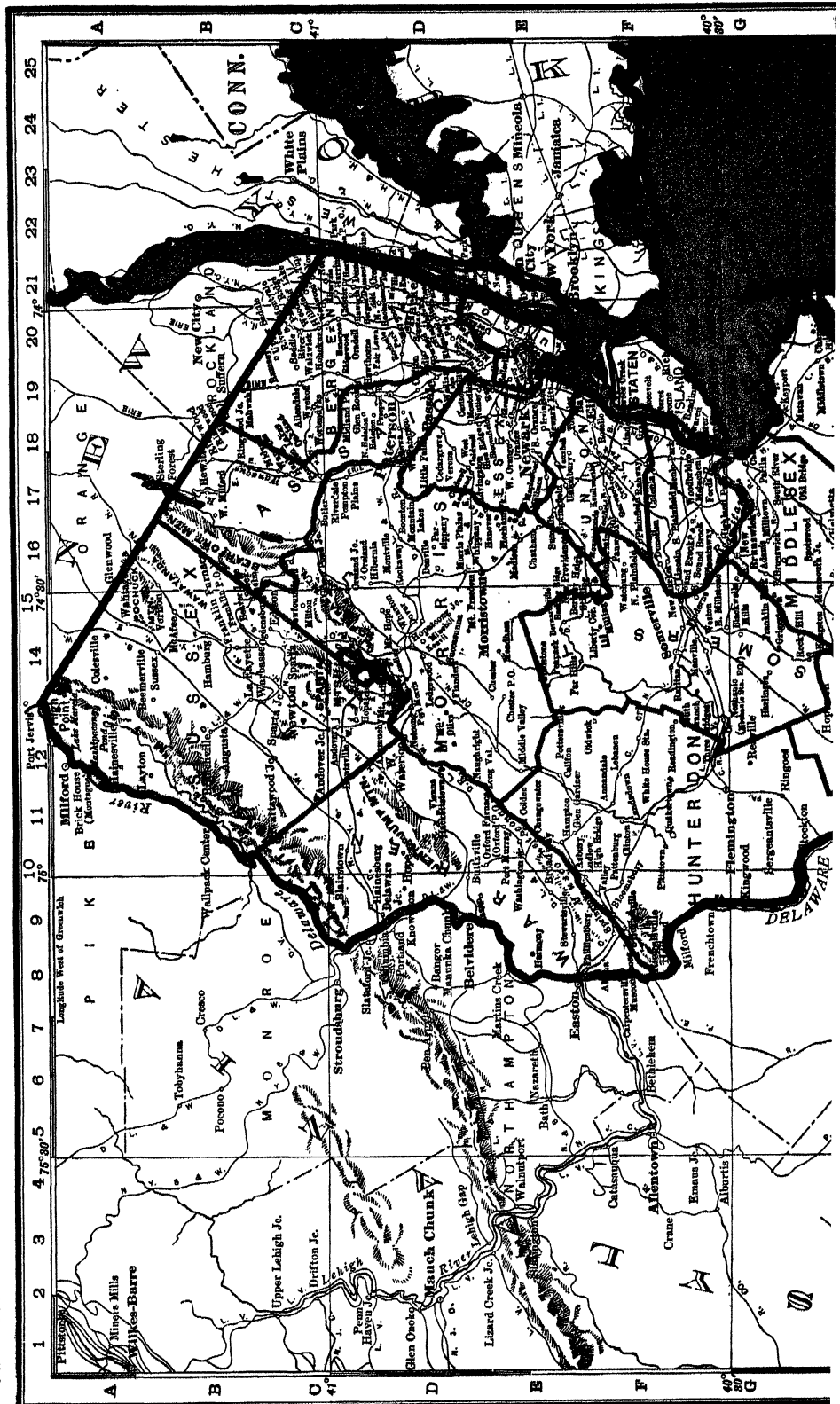
# NEW JERSEY

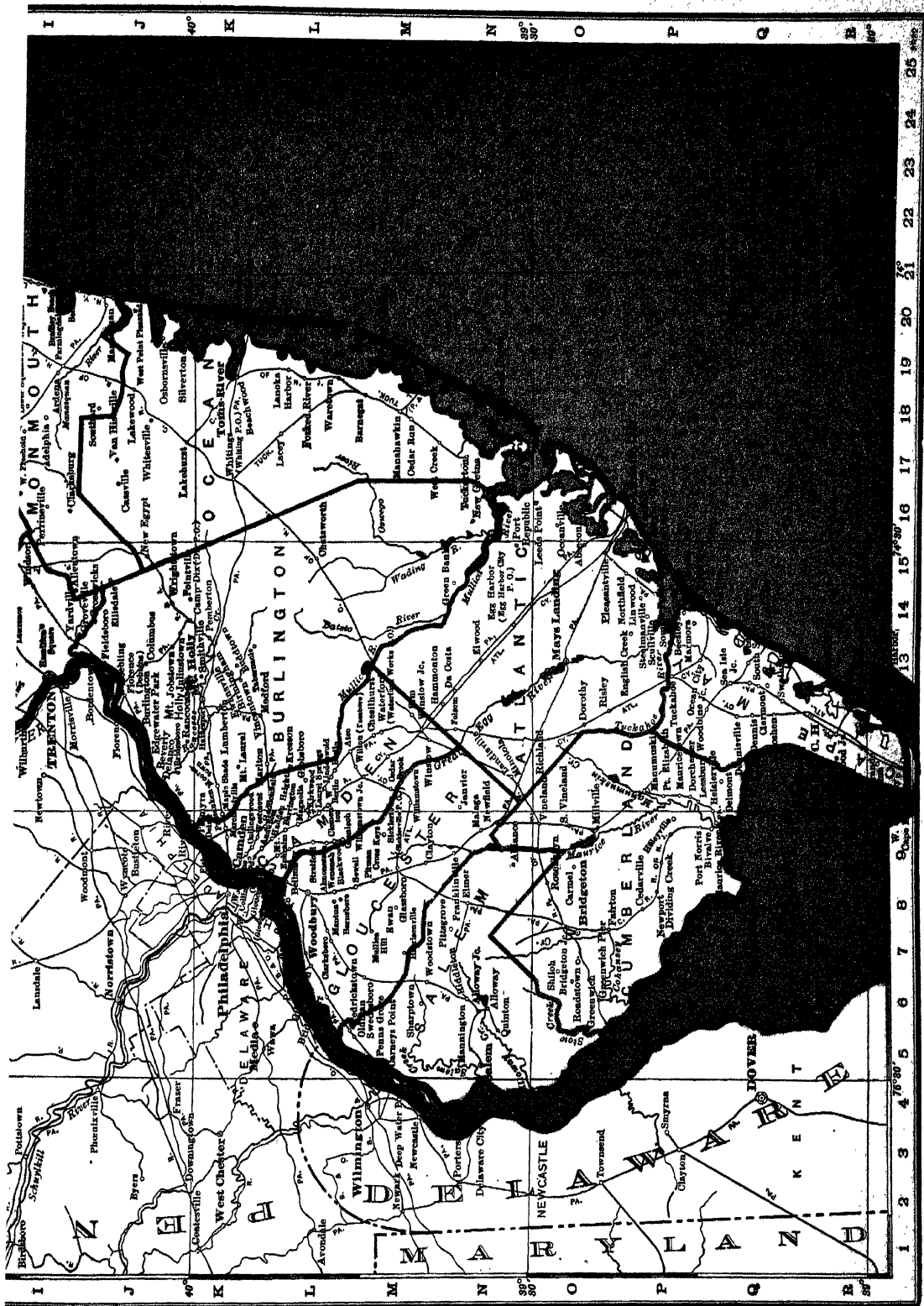
Area, 8,224 sq. m.  
Pop. 4,041,334

## PRINCIPAL CITIES

### Pop.—Thousands

- 15 Asbury Pk. I 21
- 66 Atlantic City P 16
- 9 Audubon... K 9
- 89 Bayonne... E 19
- 97 Belleville... E 19
- 9 Bergenfield D 21
- 38 Bloomfield E 18
- 7 Bogota... D 20
- 7 Boonton... D 16
- 7 Bound Brook F 15
- 16 Bridgeton... O 7
- 11 Burlington J 12
- 119 Camden... K 9
- 18 Carteret (Roosevelt) F 18
- 15 Cliffside Pk. D 21
- 47 Clifton... D 19
- 18 Collingswood K 9
- 10 Dover... D 15
- 6 Dumont... C 21
- 68 E. Orange... E 18
- 115 Elizabeth F 18
- 18 Englewood D 21
- 6 Fair Lawn... D 20
- 9 Fairview... D 20
- 9 Fort Lee... D 21
- 7 Freehold... I 18
- 30 Garfield... D 20
- 7 Glen Ridge E 19
- 14 Gloucester... K 19
- 7 Guttenberg E 21
- 25 Hackensack D 20
- 8 Hammonton M 12
- 16 Harrison... E 19
- 12 Hawthorne D 19
- 9 Highland Park G 16
- 57 Hoboken... E 20
- 57 Irvington... E 18
- 317 Jersey City E 20
- 41 Kearney... E 19
- 21 Lincoln (Mid-dlesex)... F 15
- 12 Linden... D 20
- 12 Loch D 20
- 18 Long Branch H 21
- 8 Madison... E 16
- 6 Metuchen... G 17
- 15 Millville... K 10
- 42 Montclair D 18
- 15 Morristown E 16
- 7 Mt. Holly K 12
- 442 Newark... E 19
- 35 New Brunswick G 16
- 10 N. Plainfield F 16
- 21 Nutley... E 19
- 6 Ocean City P 15
- 35 Orange... E 18
- 7 Palisades Pk. D 21
- 68 Passaic... D 19
- 139 Paterson D 19
- 7 Paulsboro... L 7
- 6 Penns Gr. M 6
- 44 Perth Amboy G 18
- 19 Phillipsburg E 8
- 34 Plainfield F 16
- 12 Pleasantville O 15
- 7 Princeton H 13
- 16 Rahway... F 17
- 12 Red Bank H 20
- 11 Ridgewood D 20
- 12 Ridgewood C 19
- 13 Roselle... F 18
- 9 Roselle Pk. F 18
- 15 Rutherford E 19
- 9 Salem... G 15
- 9 Sayreville G 15
- 9 Secaucus E 20
- 9 Somerville F 14
- 9 S. Orange E 18
- 9 S. River... E 17
- 15 Summit... E 17
- 6 Tenafly... D 21
- 123 Trenton... I 13
- 59 Union City E 20
- 7 Ventnor... J 16
- 7 Verona... J 18
- 9 Vineland O 10
- 9 Wallington D 19
- 16 Westfield F 17
- 37 W. New York E 21
- 24 W. Orange E 18
- 8 Woodbury... L 8





13 14 15 16 17 18 19 20 21 22 23 24 25

9 8 7 6 5 4 3 2 1



the states in total value, \$29,466,312, of domestic animals on farms. Among these were cattle, 174,699 valued at \$17,218,305; horses, 39,269, \$4,572,841; mules, 3,484, \$419,290; swine, 128,466, \$1,948,816, and sheep, 11,744, \$114,803.

Of the cows on farms, 120,813 were kept mainly for milk production and 1,992 mainly for beef production. In 1929 81,772,540 gals. of milk were produced; the total value of dairy products marketed, practically all whole milk, was \$20,841,117. The value of all poultry raised was \$11,858,043. The number and value of the chief kinds were chickens, 7,994,678, \$11,263,383; ducks, 274,491, \$374,265; turkeys, 31,609, \$151,093, and geese, 22,722, \$69,302. The chickens sold, 4,343,236 in number, were valued at \$6,263,356. Of 35,956,313 doz. chicken eggs produced, valued at \$15,306,486, 31,442,084 doz., with a value of \$13,380,885, were marketed.

**Fisheries.** In 1930, New Jersey ranked fifth among the states in the value of its commercial fish catch, the total amount being 110,001,000 lbs., valued at \$8,731,000. The most valuable takes were those of oysters, squeteague, bluefish, clams, shad, flounders, sea bass and cod. Practically all of the fishing was from small boats, rather than deep-sea fishing vessels.

The state issued 200,952 fishing licenses in 1930, receiving \$295,228 in fees from sportsmen. Two fish hatcheries are operated by the state at a cost of \$86,284 in 1930. Fifteen men were employed and the output included 650,182 trout, 131,000 bass and 95,105,450 commercial species. About 25,000 game fish were planted in New Jersey waters by the U.S. Bureau of Fisheries in 1930.

**Transportation.** Bounded on three sides by the Delaware River, Delaware Bay, the Atlantic Ocean, New York harbor and the Hudson River, New Jersey has adequate facilities for transportation by water. The principal ports, other than Hoboken and Jersey City, which are included in the port of New York, are Newark, Bayonne, Perth Amboy and Carteret. The Delaware and Raritan Canal, and the Morris Canal are of local commercial importance. Due to its geographical position, the state is crossed by all railway systems approaching New York from the south and west, and all those entering Philadelphia from the east. The eastern terminals of all railroads except the Pennsylvania running into New York City are located in Jersey City, Hoboken and Weehawken. From there passengers and freight are transported to New York by ferries and electric railway tunnels under the Hudson River. In 1930 the state's total railway mileage was 2,297.

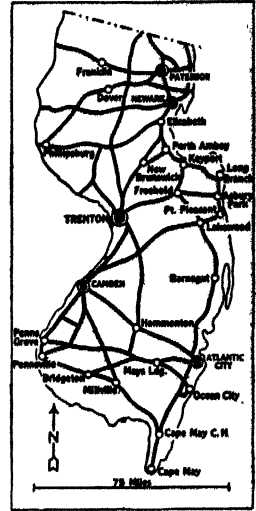
In 1891, New Jersey was the first state in the Union to pass a state aid highway act. Since then it has spent many millions of dollars in improving and extending its highway system. Although the highways are in good condition throughout the state, its joint undertakings with the New York port authorities in the improvement of interstate highway facilities are outstanding. The Holland tunnel, 9,250 ft. long, connecting the two states under the Hudson River, is by

far the longest vehicle tube in the world, transporting over 16 million vehicles annually. From the mouth of this tunnel, the state has constructed an express highway under Jersey City and around Newark and Elizabeth, expediting through traffic to Philadelphia, Washington and shore points. Interstate bridges to Staten Island have been constructed at Perth Amboy, Elizabeth and Bayonne, while the completion of the new George Washington Memorial suspension bridge with a span 3,500 ft. long, from Bergen Co. to New York City, marks a unique engineering feat jointly sponsored by the states of New Jersey and New York. On Jan. 1, 1930, there were 26,284 mi. of highways, including 9,077 mi. of surfaced roads and 1,759 mi. of improved state highways. The total expenditure during 1929 was \$52,553,804, of which \$32,966,624 was paid by the state and \$19,387,180 by county and local governments. Motor vehicle registrations were 852,850 in 1930 compared with 580,554 in 1925, an increase of about 47%. Truck registrations rose from 111,398 in 1925 to 133,154 in 1930, while during the same period the number of buses increased from 2,366 to 6,434, or over 170%.

**Manufactures.** About 1860 manufacturing became the dominant industry of New Jersey which has long ranked among the foremost industrial states. Among the factors contributing to its advancement are its advantageous position between the populous market areas of New York City and Philadelphia and its unexcelled transportation facilities by rail and water for the wider distribution of its products. Since 1900 New Jersey has shared to a marked degree in the great expansion of American manufactures. During the 30-year period 1899-1929 the increase in the value of its products was about 540%.

According to the Census of 1930 New Jersey with manufactures for 1929 valued at \$3,937,156,775 stood sixth among the states. Its 8,388 establishments gave employment to 74,248 officers and employees, who received \$198,265,860 in salaries, and to 442,328 wage earners, who were paid \$610,596,378 in wages. These factories used a total of 1,645,408 horse power, expended \$83,622,915 for fuel and power, and \$2,082,104,211 for materials and supplies, and added by the process of manufacture \$1,771,429,649 to the value of their output.

In this greatly diversified output there were 185 separately enumerated groups of manufactures. The state ranked first in dyeing and finishing textiles, sec-



NEW JERSEY STATE ROADS



and in the production of silk and rayon, pottery, pottery, and ship building, and third in petroleum refining, motion pictures, electrical machinery, canned vegetables, paints and varnishes and pumps. Among the products in which New Jersey ranked fourth were worsted goods, leather, jewelry, wooden boxes, corsets, toys and games; patent medicines and wall paper. The state stood fifth in cigars and cigarettes, and manufactured gas; sixth in paper boxes and ice cream, and seventh in motor vehicles, men's clothing, knit goods, steam fittings and glass. It ranked eighth in iron and steel rolling mill products, foundry and machine shop products, women's clothing and paper, and ninth in bread and bakery products, beverages and printing and publishing, book and job.

The leading manufactures, which included 54% of the total output of the state, in order of value were:

Industry or Product	No. Persons Employed	Value of Products \$
Copper refining .....	4,294	302,546,434
Petroleum refining .....	9,208	297,151,470
Electrical machinery .....	54,683	292,785,977
Chemicals .....	16,740	155,782,630
Foundry and machine shop products .....	27,271	135,991,319
Motor vehicles .....	5,941	131,597,697
Silk and rayon .....	23,000	126,307,598
Dyeing and finishing textiles .....	25,964	113,558,338
Brass and bronze .....	4,831	94,955,465
Meat packing .....	3,406	88,945,411
Paints and varnishes .....	6,193	82,292,896
Cigars and cigarettes .....	10,473	75,585,311
Canned fruits and vegetables .....	5,283	73,317,872
Bread and bakery products .....	7,804	57,298,063
Iron and steel rolling mill products .....	9,360	54,895,192
Rubber goods .....	8,944	50,796,712

The chief industrial area comprises Bergen, Essex, Hudson, Middlesex, Passaic and Union counties in the extreme northeast, centering about New York harbor. These counties form one of the foremost manufacturing districts in the United States, with products in 1929 valued at \$3,150,403,610, or 80% of the total for the state. Leading cities in this district, with value of output, were Newark, \$501,803,991; Jersey City, \$317,469,167; Perth Amboy, \$273,409,650; Bayonne, \$233,103,633; Paterson, \$196,297,662; Kearny, \$187,723,713, and Elizabeth, \$122,448,457. Other important factory centers were Camden, \$231,135,097, and Trenton, \$107,842,837, both situated near Philadelphia.

**Commerce.** According to the census of 1930, there were in 1929 2,348 wholesaling establishments in New Jersey with total sales of \$1,014,458,630. These organizations gave full-time employment to 27,777 men and women, whose annual salaries and wages aggregated \$35,942,939. The chief wholesaling center is Newark, with Jersey City, Paterson, Elizabeth and Perth Amboy also important.

The total sales of the 60,203 retail stores amounted to \$1,851,405,393. Sales per store averaged \$30,753; sales per capita were \$458.12.

For water-borne commerce see NEW YORK; Commerce.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Food .....	25,681	\$566,567,582	30.61
Automotive .....	7,683	325,442,200	17.60
General Mdse. ....	3,061	206,689,461	11.15
Lumber & Bldg. ....	3,110	161,768,240	8.74
Apparel .....	5,080	149,577,981	8.08
Furn. & Household ..	1,478	83,322,282	4.50
All other stores ....	14,110	358,037,647	19.32

Total, all stores ... 60,203 \$1,851,405,393 100.00

**Finance and Banking.** The assessed value of all taxable property in 1928 was \$6,479,762,221. On June 1, 1930, the total bonded debt was \$118,000,000, less sinking funds of \$25,950,000. Total state revenues in 1930 were \$113,513,795; total disbursements, \$109,410,286. The chief sources of income included taxes on gasoline sales, \$10,365,988, motor vehicles, \$15,249,386, and general property and corporation taxes. The disbursements included expenditures for highways, \$37,727,491, schools, \$17,197,460, and institutions, \$4,412,025.

The first two banks in New Jersey were chartered by the legislature in 1804. In 1812 a general banking law was passed which made reports compulsory and regulated the total indebtedness and rate of discount. However, due to lax supervision, many banks successfully avoided the provisions of the law and flooded the state with worthless paper currency. In 1837 this led to suspension of specie payments by many banks. In 1850 a new law was passed, modeled after that of New York state, providing for strict periodic examination. This law, with the succeeding national banking law, placed the state's banking structure on a sound basis. Since 1880, trust companies have increased rapidly, due to their liberal charter provisions. In 1930, there were 560 banks in New Jersey. Of these, 295 were national banks, 260 trust companies or state banks and 5 private banks. These institutions had an aggregate capital of \$141,669,839; their surplus and undivided profits were \$235,717,000. Their total resources in 1930 were \$2,800,499,000, with loans and discounts, including rediscounts, aggregating \$1,566,477,000. Per capita demand and time deposits were \$557.22; per capita savings deposits, \$330.37. The total savings of \$1,338,013,000 were owned by 2,827,092 depositors. National bank circulation aggregated \$23,591,000. Bank clearings 543,905,000 in northern New Jersey, the state's most active banking centers.

**Government.** The legislative body of New Jersey consists of a Senate composed of 21 members and a House of Representatives of 60 members, the former elected for terms of three years and the latter for terms of one year. They meet in annual sessions of unlimited duration. The chief executive is the governor elected for a term of three years, but ineligible to succeed himself. He has the power, subject to approval of the Senate, of appointing the attorney-general, secretary of state, judges of various courts, prosecutors of pleas, clerk of the supreme court, and clerk of the court of chancery. The treasurer and comp-

troller are chosen by the general assembly. Judiciary power is vested in a court of errors and appeals, a court for the trial of impeachments, a court of chancery, a circuit court, and inferior courts. The court of errors and appeals, the highest tribunal, consists of 16 judges, composed of a chancellor, the justices of the supreme court and 6 additional judges, chosen by the governor and the senate for terms of seven years at salaries of \$15,000 per annum.

**Social Welfare Institutions.** The State Department of Institutions and Agencies controls the social welfare institutions. There is a training school for mentally retarded girls at Totona, a school for the deaf at Trenton, a manual training and industrial school for colored youths at Bordentown, and a state school at Vineland. A home for disabled soldiers is maintained at Kearny and one for disabled soldiers and sailors and their wives at Vineland. There is a firemen's home at Boonton. Hospitals for the insane are at Trenton and Greystone Park. A tuberculosis sanitarium is at Glen Garden and a village for epileptics near Skillman. A home for feeble-minded women is located at Vineland and colonies for feeble-minded men at New Lisbon and Woodbine. At Clinton Farms is a reformatory for women, at Rahway and Annandale one for men, at Trenton one for girls, a reformatory and home for boys at Jamestown and a prison farm at Leesburg. The state prison is at Trenton. In 1931 a third hospital for the insane was started at Hillsdale.

**Education.** The first school was established in 1661-62, by Dutch settlers at Bergen. This was followed by English schools at Newark in 1676 and at Woodbridge in 1689. The first law establishing schoolmasters in the province was passed by the East Jersey Assembly at Perth Amboy in 1693, and a modern school law was passed in 1867. In 1928 there were 2,300 public schools, with 26,414 teachers and 753,753 enrolled pupils, and 157 public high schools with 3,019 teachers and 100,045 pupils. Children from 7 to 14 years of age (7 to 17 years if unemployed) are required by law to attend school the full term.

The number of persons from 5 to 20 years of age attending school in 1930 was 871,532, or 72.7% of the population within the ages specified, as compared with 603,143, or 65.6%, in 1920. The number of persons 10 years and over unable to read and write in 1930 was 128,023, or 3.8%, as compared with 127,661, or 5.1%, in 1920. Foreign-born white illiterates numbered 107,192, or 12.9% in 1930, and 111,595, or 15.3%, in 1920.

Among the institutions of higher learning, the state maintains an agricultural college and experiment station in connection with Rutgers University at Brunswick; normal schools at Trenton, Montclair, Newark, Paterson and Glassboro; a school for the deaf at Trenton, and a Manual Training and Industrial School for Colored Youth at Bordentown. There are industrial schools in Newark, Trenton and Hoboken, partially state-supported. In addition to Rutgers, there are

numerous private institutions for higher education, the most important of which are Princeton University, Stevens Institute of Technology at Hoboken, Drew University at Madison, and Princeton Theological Seminary. The New Jersey Public Library Commission has its headquarters at Trenton.

**Population.** In 1930 New Jersey ranked ninth among the states with a population of 4,041,334 or an average of 537.8 per sq. mi., an increase of 885,434 or 28.1% over 1920. The population rose from 184,139 in 1790 to 489,555 in 1850, 1,883,669 in 1900, 2,537,167 in 1910 and 3,155,900 in 1920. In 1930 there were 3,829,209 or 94.8% whites, and 208,828 or 5.2% Negroes, an increase of 26.1% whites and 78.3% Negroes from 1920. Of the whites, 2,984,767 were native-born and 844,442 were foreign-born, an increase in the latter of 105,829 from 1920. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 507,180 or 22.5% were Italian; 345,060 or 15.3%, German; 262,708 or 11.6%, Polish; 194,804 or 8.6%, Irish; 149,774 or 6.6%, English; 147,754 or 6.5%, Russian. The urban population was 3,339,244 or 82.6% of the total, an increase of 864,308 or 34.9% since 1920; the rural population was 702,090 or 17.4% of the total, an increase of 21,126 or 3.1% from 1920. In 1930 there were six cities of 100,000 and upwards: Newark, 442,337; Jersey City, 316,715; Paterson, 138,513; Trenton, 123,356; Camden, 118,700; Elizabeth, 114,589.

**Occupations.** In 1930 1,712,075 persons or 42.4% of the population, were gainful workers 10 years old or older; 75.7% of these were males and 24.3% were females; 66.1% were native white; 27.5% foreign-born white, and 6.3% Negro. Of the females 15 years old or older 64.2% were single, 24.4% were married and 11.4% were widowed or divorced.

Among the chief occupations, with number of workers, were factory operatives, 133,882 men and 93,317 women, including 31,587 persons in clothing industries, 16,451 persons in electrical machinery factories, 23,034 persons in iron and steel industries and 24,174 persons in silk mills; clerks, 87,513 men and 50,277 women; factory laborers, 83,877; retail dealers, 74,756; salespersons, 55,702 men and 18,505 women; servants, 14,283 men and 56,995 women; farmers, 25,684, and farm wage workers, 34,509; chauffeurs, 48,476; carpenters, 44,843; stenographers, 1,935 men and 39,825 women; school teachers, 5,075 men and 28,168 women; machinists, 32,150; bookkeepers and cashiers, 12,962 men and 17,377 women; building construction laborers, 22,290, and painters and glaziers, 21,726.

## HISTORY

The first authenticated visits are those of Verrazano, Gomez, and Hudson (*see* New York) to the ocean coast of New Jersey, and of Hudson, Mey, and Hendrickson (*see* Delaware) into the Delaware. Ft. Nassau, on the Delaware near the present Nassau City, was founded in 1623, by part of the first contingent of settlers to New Amsterdam. Dutch farmers and traders from New Netherland estab-

lished themselves on the Jersey shore of the North River, and penetrated the river valleys leading from New York bay. In 1643 Ft. Elfsborg was built by Swedish colonists near the present Salem. The Swedish communities passed under Dutch domination in 1655, and fell with New Amsterdam into possession of the English in 1664. The Jersey country was granted by the Duke of York to Lord John Berkeley and Sir George Carteret; the next year, 1665, the proprietors published the famous *Concession and Agreement*, offering special inducements in land grants and in political privileges to attract settlers. Colonists from New England led the response. Philip Carteret, the first governor, arrived in 1665 and made Elizabethtown his capital. Berkeley sold his interest in March, 1674, to John Fenwicke and Edward Byllynge, Quakers, this share later passing into the hands of William Penn, Nicholas Lucas, and Gawen Lawrie. On July 1, 1676, the province was divided along a line from Little Egg harbor to the northwest corner; Carteret received the eastern part, East Jersey, and the Quaker associates the remainder, West Jersey. East Jersey was offered at public auction in 1682 by Carteret's trustees, and purchased by Penn and 23 associates. Perth Amboy became the capital in 1686. Burlington, founded by Quaker colonists in 1677, was the capital of West Jersey. Jurisdiction was transferred to the Crown in 1702, the proprietors retaining the soil rights; the two provinces were then united under a royal government. The governor of New York was also governor of New Jersey until 1738, although the legislatures were separate; thereafter New Jersey had its own governor. Freedom of worship was denied only to Catholics; but high property qualifications restricted suffrage.

Agriculture, the leading pursuit, expanded with the growth of New York and Philadelphia as commercial centers. But paper mills and other manufactures were well established by 1750, when the colony numbered about 80,000 inhabitants. The building of ferries and post roads facilitated communication. Scotch-Irish, Huguenot, and Palatine emigrants established settlements; western Jersey became less recognizably Quaker. Disputes between the people and the proprietors over land titles and between the assembly and the royal governor over prerogatives and economic privileges prepared the colony for the turbulence of Revolutionary times. The loyal governor, William Franklin, was banished in 1776. On July 2 of the same year the extra-legal provincial congress adopted a state constitution, and 16 days later ratified the DECLARATION OF INDEPENDENCE. Its commerce threatened by discriminatory regulations of New York and Pennsylvania at their respective ports, New Jersey favored the strengthening of the federal Union, and was ably represented in the CONSTITUTIONAL CONVENTION by William Patterson (*see* CONSTITUTION). The vote of the state's ratifying convention, Dec. 18, 1787, was unanimous. The seat of government, having alternated between Perth Amboy and Burlington since East and West Jersey were

united, was fixed at Trenton in 1790. Long agitation for democratic revision of the constitution culminated successfully in 1844. Although favoring compromise in the slavery controversy, the state gave four of its seven votes to Lincoln, 1860, and contributed 89,305 men to the Union armies. Large corporations, including the Pennsylvania Railway Company, which for several years after the Civil War possessed a virtual monopoly of railways and canals in the state, and many combinations of capital attracted by the extremely liberal incorporation and taxation laws of the state dominated the government without serious opposition until 1907. Under the leadership of Gov. WOODROW WILSON anti-monopolistic legislation and measures correcting election abuses were enacted. New Jersey Democrats have controlled the governorship within recent years. Although consistently a Republican state in national politics, with the exception of the 1912 election, New Jersey in 1932 gave its 16 electoral votes to Roosevelt. W. Warren Barbour, Republican, was reelected senator.

**BIBLIOGRAPHY.**—Isaac S. Mulford, *Civil and Political History of New Jersey*, 1851; E. P. Tanner, *The Province of New Jersey*, 1908.

**NEW JERSEY COLLEGE FOR WOMEN**, an institution at New Brunswick, N.J., was established by the trustees of the state-controlled RUTGERS UNIVERSITY in 1918 as an integral part of that institution. It is entirely disassociated from Rutgers and is located in a different part of the city. It offers both liberal and technical courses. The productive funds in 1931 were \$1,808,621, and there were approximately 39,000 volumes in the library. In 1931-32, the college had an enrollment of 1,074 students, and a faculty of 121 headed by Dean Mabel S. Douglass.

**NEW JERSEY TEA** (*Ceanothus americanus*), a small shrub of the buckthorn family called also red-root and mountain-sweet. It grows in dry open woods widely throughout eastern North America. The erect or spreading much-branched stems, which rise from a stout, woody, reddish root, bear oblong three-nerved leaves and small white flowers in dense roundish clusters. The astringent leaves were used by the American troops during the Revolutionary War as a substitute for tea. *See also* CEANOTHUS.

**NEW KENSINGTON**, a borough of Westmoreland Co., southwestern Pennsylvania, situated on the Allegheny River, 18 mi. northeast of Pittsburgh. It is served by the Pennsylvania Railroad. The borough is an important coal-mining and industrial center. The manufactured output, 1927, was worth \$30,234,183, and included tin plate, aluminum, glass and white lead. In 1929 the retail business amounted to \$13,491,921. New Kensington was founded in 1891 and incorporated in 1892. In 1930 Parnassus, Pa., which had a population then of 6,240, was consolidated with it. Pop. 1920, 11,987; 1930, 16,762.

**NEWLANDS, FRANCIS GRIFFITH** (1848-1917), American legislator, was born in Natchez, Miss., on Aug. 28, 1848. After studying at Yale and Columbian law school at Washington, D.C., he estab-

lished a law practice in San Francisco in 1870. He migrated in 1888 to Nevada, from which state he went as a Democrat representative to Congress in 1893. During his ten years in the House he championed legislation for the irrigation of western lands at federal expense. He was also a consistent advocate of free and unlimited coinage of silver in the early years of his political career. He was elected in 1903 to the United States Senate, and reelected in 1909 and 1915. In 1913 he sponsored the Newlands Act, providing for mediation and arbitration in railway wage disputes. He died at Washington on Dec. 24, 1917.

**NEW LONDON**, a port city in southeastern Connecticut, one of the county seats of New London Co., situated on the Thames River, 3 mi. from Long Island Sound. Bus and truck lines, airplanes, steamship lines and two railroads afford transportation. New London is situated on a slope, commanding a view of the natural harbor. The port is defended by the United States Submarine Base and Ft. H. G. Wright, on Fisher's Island, 8 mi. southeast of the city. On either side of the river are Ft. Trumbull, with the Coast Guard Academy and section base, and Ft. Griswold. New London exports chiefly automobiles, and imports lumber. Silk, underwear, machinery, dental tubes and boats are the principal manufactures. In 1929 the factory output was approximately \$12,000,000; the retail trade was valued at \$20,413,781. The city was settled in 1658; incorporated in 1784. The spots of interest are Shaw Mansion, visited by Washington, Huguenot House, the old Town Mill and the Connecticut College for Women. Richard Mansfield, the actor, lived in New London. Pop. 1920, 25,688; 1930, 29,640.

**NEWMAN, ERNEST** (1869- ), English music critic, was born at Liverpool, Nov. 30, 1869. He was educated at Liverpool College and at Liverpool University. In 1903 he began to teach music at Birmingham Midland Institute. He was appointed music critic on the *Manchester Guardian* in 1905, and of the *London Sunday Times* in 1919. His writings include several books on Richard Wagner, also *Elgar*, *Hugo Wolf*, *Richard Strauss*, *A Musical Medley* and *A Music Critic's Holiday*, published in 1925. His music criticism, often novel in conclusion, is characterized by scholarship and grace of style.

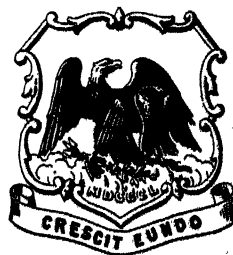
**NEWMAN, JOHN HENRY** (1801-90), English Cardinal and author, was born in London, Feb. 21, 1801, son of a banker. He was educated at Trinity College, Oxford, and at 21 received a Fellowship at Oriel College. He was ordained to the Anglican ministry, and in 1828 became vicar of St. Mary's, the university church. Four years later he undertook a memorable Mediterranean voyage, including a visit to Rome. While becalmed in the Straits of Bonifacio, he penned his famous hymn, "Lead, Kindly Light." Immediately on his return in 1833, he joined with Keble and Froude in what became known as the Oxford or Tractarian Movement, publishing during the next seven years the famous *Tracts for the Times* in which he discussed Anglican doctrine and ecclesiastical his-

tory. *Tract 90* caused the termination of the series by the order of the Bishop of Oxford. After 12 years of study Newman found himself more and more drawn from his allegiance to the Anglican church. In 1845 he was received by Father Dominic, an Italian Passionist, into the communion of the Roman Catholic church. The next year he made his second visit to Rome and was ordained a priest by Cardinal Fransoni, receiving the degree of D.D. from the Pope. On his return he established an English branch of the Congregation of the Oratory. In 1864, he was called from his retirement at the Birmingham Oratory, by an attack on the part of Charles Kingsley, which inspired Newman to write his most famous work, the *Apologia pro vita sua*, one of the world's greatest religious autobiographies. In 1879 Pope Leo XIII created him Cardinal Deacon of the Title of St. George in Velabro. Throughout his eventful career, Newman held the front rank among English preachers, was greatly esteemed for the fresh and beautiful vigor of his prose style, and exerted an immense influence in guiding the thoughts of others toward union with the Roman communion. Among his well-known writings are *The Grammar of Assent*, the *Idea of a University*, and a long poem, *The Dream of Gerontius*.

**NEWMARKET**, a market town of Cambridgeshire, England, about 69 mi. northeast of London. Founded in 1227 when the inhabitants of adjacent Exning fled there from a plague, the famed horse races were instituted by James I. Under Charles I and II Newmarket reached its heyday, and portions of the Royal Palace erected by Charles II still survive, together with the houses of Nell Gwynne and the Duke of Queensbury. The racecourse, southwest of the town, is traversed by an earthwork known as the Devil's Dyke and is attributed to the Icenii of the Iron Age. To-day Newmarket is a place of racing and training establishments and holds eight annual meets. Pop. (of town and district) 1921, 18,647; 1931, 18,868.

**NEW MEXICO**, one of the southwestern states of the United States, popularly called the "Sunshine State." It lies approximately between 31° and 37° N. lat. and 103° and 109° W. long. The state is bounded on the north by Colorado, on the east by Oklahoma and Texas, on the south by Texas and Mexico and on the west by Arizona. New Mexico comprises an area of 122,634 sq. mi., inclusive of 131 sq. mi. of water surface. In size New Mexico ranks fourth among the states of the Union.

**Surface Features.** The surface of New Mexico is that of a great plateau having a mean elevation above sea level of 5,700 ft., and a total relief of 10,430 ft. The highest point is North Truchas Peak, 13,306



NEW MEXICO STATE SEAL

ft., in Rio Arriba Co.; the lowest, 2,856 ft., at Red Bluff in Eddy Co. Conventionally the state belongs to three physiographic provinces: the Great Plains, Colorado plateaus and Mexican highlands. In addition the San Juan and Sangre de Cristo ranges of the Rocky Mountains project for some distance across the northern boundary.

The broad, uneroded expanse of the high plains of Colorado and western Kansas continue southward into Texas and New Mexico where they are known as the *Llano Estacado* or Staked Plains. Between this region and the mountains in New Mexico is a broken and eroded strip consisting of the Las Vegas plateau and the Pecos valley. The former is dissected into a number of small mesas, mostly lava-capped, and surmounted by many volcanic necks and a few volcanic cones such as Mt. Capulin. The Canadian River and its tributaries have cut deep canyons across it, and the Canadian escarpment, 1,000 to 1,500 ft. high, limits it on the south.

The Pecos section is a long trough of varied topography, the unity of which lies in the fact that the whole is eroded to a level below the high plains and the Las Vegas plateau. Its chief feature is the Pecos River which rises in the Rocky Mountains and flows southward through New Mexico into Texas.

Facing the Pecos valley region from north to south are the Glorietta mesa, the Pedernal hills, and the Sierra Blanca, Sacramento and Guadalupe mountain ranges, which constitute the eastern boundary of the Mexican highlands. This region takes in the entire southwestern part of the state and is defined on the north by the Datil range near the western border in Catron Co., and a line running generally northeastward to Albuquerque and east to the Glorietta mesa. Its surface is about equally divided between mountain ranges and desert basins.

East of the Rio Grande the mountain ranges may be grouped into two north and south lines 10 to 50 mi. apart. Between is a fairly continuous flat-floored trough subdivided into bolsons. Across the Rio Grande from Albuquerque are the Sandia Mountains and south in order are the Manzano, Montoso, Chupadera mesa, Oscura ranges, San Andreas, Organ and Franklin mountains. Between these and the line of ranges to the east, named above, is a desert plain. Its upper part is known as the Estancia valley or Sandoval bolson, and is an ancient lake bed now composed of salt basins and dunes. The lower part is the Tularosa desert.

A second desert trough is the Jornada del Muerto which is followed by the Rio Grande from Albuquerque to El Paso except where the river detours around to the west of the Fra Cristobal and Caballo ranges.

West of the Rio Grande there is no orderly arrangement of mountains and bolsons and many of the small ranges have no names. The plains of San Augustin in Catron and Socorro counties are the outstanding feature.

The northwestern part of the state belongs to the

Navajo section of the plateau and canyon country of western Colorado and northern Arizona. This section is a high plain scarped by mesas, trenched by shallow canyons, and surmounted by volcanic necks and cones. In northern Valencia Co. is Mt. Taylor, 11,389 ft. high, and west of it the Zuni uplift, an elongated dome culminating in Mt. Sedgwick, 9,200 ft. above the sea. The area to the south of these mountains is a field of lava above which protrude the craters of extinct volcanoes.

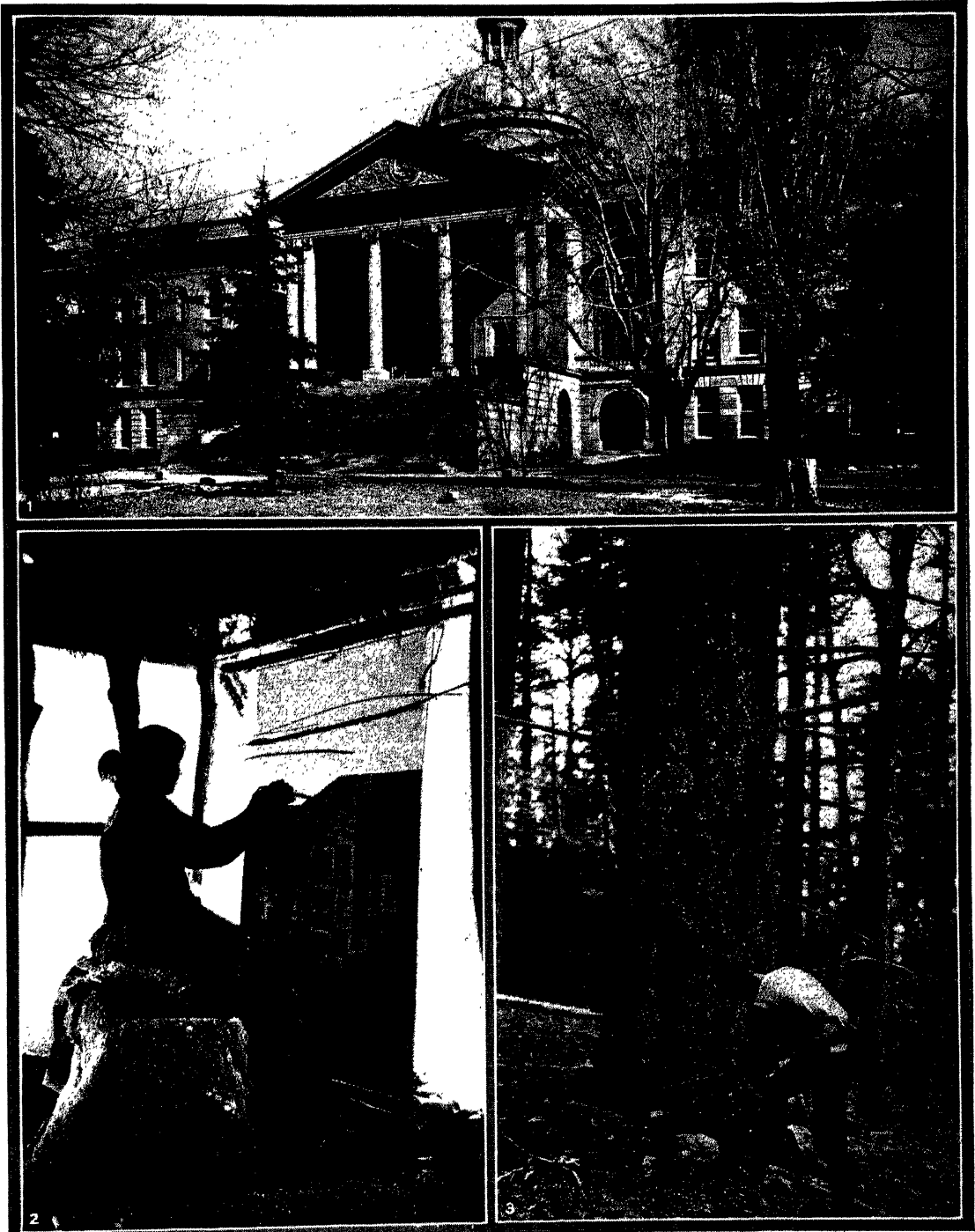
New Mexico slopes toward the south and is drained by the Rio Grande and Pecos rivers into the Gulf of Mexico, except for the southwestern corner drained by the Gila River into the Gulf of California.

**Climate.** Notwithstanding its southerly position, New Mexico, because of its generally high altitude and low average humidity, enjoys a rather cool and extremely healthful climate. The mean annual temperature is 52.2° F., ranging from 48.8° F., with an average of 28.8° F. for January and 69° F. for July, at Santa Fé in the north central part to 60° F. in the lower Rio Grande valley. During the period 1892-1930 the highest temperature recorded in New Mexico was 116° F. and the lowest -41° F. The average annual precipitation is 15 in. including about 24 in. of snow, ranging from 9 in. along the lower Rio Grande to 25 in. in the higher mountains. The average growing season is from 175 to 200 days.

**Forests and Parks.** About one-fifth of the state is covered with forests located chiefly in the southern Rocky Mountains and the higher parts of the Colorado plateau. Except along water courses in the lower altitudes, they are of the semi-desert coniferous type and are characterized by juniper and pinyon. With increasing altitude cedar, western yellow pine, Douglas fir and Engelmann spruce, in the order named, predominate. Nearly half of the area of the state is in national forests and monuments, Indian and other reservations and public domain. The state owns 185,000 acres of forest land but no state forests or parks have been developed. National Forests, Apache, Carson, Coronado, Datil, Gila, Lincoln, Manzano, and Santa Fé, covering a total net area of 8,478,355 acres in 1930, are situated in the mountainous regions ranging from 2,000 to 13,000 ft. in altitude. The forests are extensively used for camping and other recreational purposes. The BANDELIER NATIONAL MONUMENT and GILA CLIFF DWELLINGS NATIONAL MONUMENT are located within them and also a large majority of the 119 state game refuges. Other Federal holdings in the state include CARLSBAD CAVERNS NATIONAL PARK, and AZTEC RUINS, CHACO CANYON, EL MORRO, and GRAN QUIVIRA national monuments.

**Minerals and Mining.** New Mexico possesses extensive and varied mineral resources. The most important so far developed commercially are copper ore and coal. Practically all the copper is produced in Grant and Hidalgo counties in the extreme southwest. The bituminous coal fields, largely undeveloped, are said to cover an area of about 15,000 sq. mi. Besides

## NEW MEXICO



1, 2, COURTESY OF THE SANTA FE CHAMBER OF COMMERCE; 1, PHOTO FROM T. HARMON PARKHURST; 2, PHOTO FROM W. T. MULLARKY; 3, U.S. FOREST SERVICE

### TYPICAL SCENES IN NEW MEXICO

1. The State Capitol at Santa Fe.
2. A Navajo Indian woman weaving a rug.
3. A United States forest ranger marking timber for cutting in a national forest.







# NEW MEXICO

Area 122,634 sq. m.  
Pop. 423,317

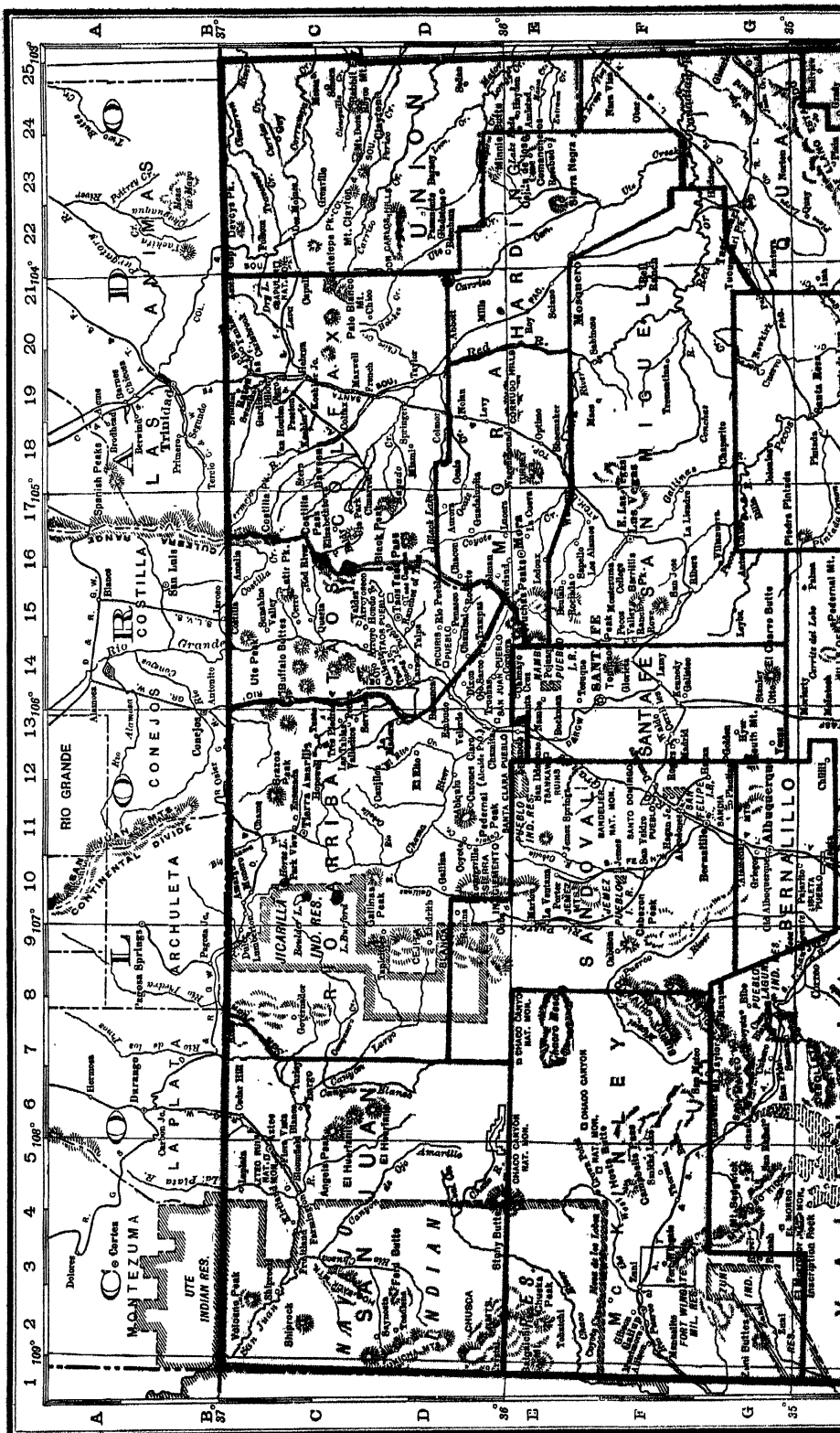
## PRINCIPAL CITIES

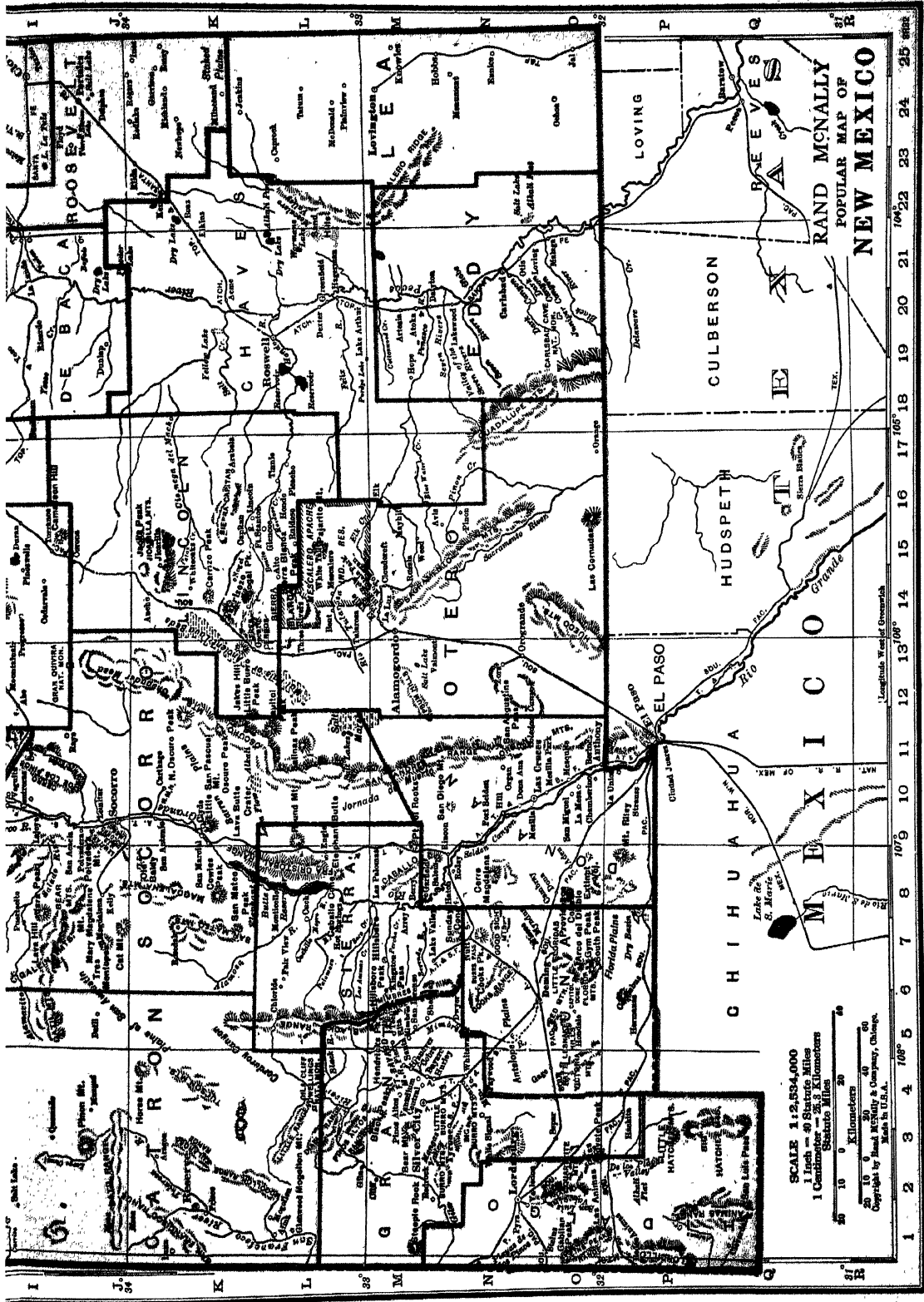
### Pop.—Thousands

- 3 Alamogordo M 12
- 27 Albuquerque G 11
- 2 Artesia M 20
- 2 Belen H 10
- 4 Carlsbad N 20
- 1 Carrizozo K 14
- 8 Clayton D 24
- 8 Clovis L 25
- 3 Deming O 6
- 4 East Las Vegas (Las Vegas town) F 17
- 1 Farmington C 4
- 6 Gallup F 2
- 1 Gardiner B 19
- 1 Hot Springs L 7
- 2 Hurley M 4
- 1 Isleta H 11
- 6 Las Cruces N 10
- 5 Las Vegas F 16
- 2 Lordsburg N 2
- 1 Lovington M 23
- 1 Magdalena J 8
- 1 Malaga O 21
- 1 Mountainair I 1
- 3 Portales J 26
- 8 Raton B 19
- 11 Roswell L 19
- 1 San Marcial K 9
- 11 Santa Fe E 14
- 1 Santa Rosa H 19
- 4 Silver City M 3
- 2 Socorro N 10
- 1 Springer D 18
- 4 Tucuman G 22
- 1 Tularosa M 13
- 1 Vaughn H 17

### Pop.—Hundreds

- 1 Acme K 20
- 1 Alto L 14
- 9 Anton Chico G 16
- 7 Aztec C 5
- 2 Bayard G 8
- 2 Bibb G 8
- 2 Buckman E 13
- 1 Casa Blanca G 7
- 3 Chacon D 16
- 7 Cimarron C 17
- 2 Cliff M 2
- 4 Columbus P 6
- 4 Cordova E 14
- 4 Des Moines C 22
- 5 Dexter L 20
- 3 Dixon D 14
- 3 Elda L 22
- 1 Ensenada C 12
- 3 Espanola E 13
- 2 Estancia H 13
- 2 Ft. Stanton K 15
- 8 Ft. Sumner I 21
- 1 Greenfield L 20
- 2 Greenville C 22
- 6 Hagerman L 21
- 4 Hatch N 8
- 3 Hobbs M 25
- 2 Hope M 19
- 2 Jai C 25
- 2 James F 11
- 2 Lake Arthur M 19
- 5 Los Lunas H 11
- 1 Marquez G 8
- 1 Maxwell C 19
- 2 Melrose I 23
- 3 Mesquite O 11
- 4 Mosquero E 21
- 2 Mills D 20
- 3 Mountain Park M 14
- 1 Pasamonte D 22
- 3 Plain H 23
- 7 Roy D 20
- 2 San Jose F 15
- 3 Santa Cruz E 14
- 3 Sherman M 6
- 6 Texico I 25
- 7 Truchas E 21
- 1 Vanadium M 4
- 9 Wagonmound E 18
- 5 Willard H 13
- 2 Youngsville D 10





SCALE 1:2,534,000  
1 inch = 40 Statute Miles  
1 Centimeter = 0.625 Statute Miles

0 10 20 30 40 50  
Kilometers

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**RAND MCNALLY**  
**POPULAR MAP OF**  
**NEW MEXICO**

Longitude West of Greenwich  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25



copper, there are valuable deposits of other ores, including gold, silver, lead, zinc and molybdenum.

With mineral productions in 1929 amounting to \$37,127,621, New Mexico stood twenty-sixth among the states, ranking second in molybdenum, fourth in fluorspar, sixth in copper, seventh in zinc and eighth in gold, silver and lead. The principal products in order of value were copper, 97,717,262 lbs., \$17,198,238; coal, 2,622,769 tons, \$8,314,000; zinc, 34,455 tons, \$4,548,060; petroleum, 1,830,000 bbls., \$2,170,000; lead, 11,130 tons, \$1,402,431; gold, 35,176 oz., \$727,162, and silver, 1,121,546 oz., \$597,784. Of less value were fluorspar, molybdenum, natural gas, sand and gravel, and clay products.

During 1929 89 mines and quarries gave employment to 7,522 persons who received \$11,404,809 in salaries and wages.

**Soil.** Sandy loams overlying clay loams constitute the predominating soils in the highlands of New Mexico. Because of scant rainfall these highlands are utilized chiefly for grazing grounds. With irrigation various crops can be grown in the river valleys where there are limited areas of relatively fertile sediment. In the plains of southern New Mexico, especially in areas with defective drainage, alkali has so permeated much of the soil that it has become unclaimable for crop production.

**Agriculture.** Crop production consists principally of grain, cotton, hay and vegetables.

In 1930 30,822,034 ac. or 39.3% of the entire land area was in farms, 31,404 in number, with an average size per farm of 981.5 ac. and an average value per acre of \$6.74. Of the farm area 1,799,190 ac. was crop land, and 28,494,225 ac., pasture land. The total value of farm property was \$293,137,906, of which \$207,859,492 was represented by land and buildings; \$12,996,727, by implements and machinery; and \$72,281,687, by domestic animals.

According to the census of 1930 New Mexico produced in 1929 field crops to the value of \$34,647,799, ranking thirty-ninth among the states. The chief crops were grains, valued at \$13,838,828, largely wheat 4,431,748 bu., corn 3,822,545 bu. and oats 453,362 bu.; cotton 90,805 bales, \$8,036,243, and cottonseed 42,380 tons, \$1,186,640; hay, 321,921 tons, \$6,236,867, chiefly alfalfa; vegetables, \$2,422,343, principally potatoes \$478,487, sweet potatoes \$439,399, and peppers \$264,028; and fruits, \$1,797,306, chiefly apples 1,135,652 bu. Farm products sold by cooperative marketing rose from \$1,047,105 in 1919 to \$2,531,299 in 1929. Farm machinery and equipment in 1930 included 15,395 automobiles, 5,328 motor trucks, 2,497 tractors, 580 electric motors and 2,018 stationary gas engines.

**Irrigation.** Although several counties east of the Rocky Mountains have sufficient rainfall for growing hay and cereals, most districts require irrigation for the production of field crops. In the Census of 1930 irrigation operations were reported for 27 of the 31 counties in New Mexico. The most extensive developments are in the drainage basins of the Rio Grande and Pecos rivers. These contain nearly three-

fourths of the irrigated lands of the state. The irrigated farms comprised 45.7% of the number and 42% of the value of all farms in New Mexico. The proportion actually irrigated was 1.7% of all land in farms and 0.7% of the land area of the state.

The total number of irrigated farms was 14,347, with an aggregate area of 5,024,868 ac., of which 527,033 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$87,868,916, or an average of \$17.49 per ac. The total investment in irrigation enterprises to 1930 was \$19,834,380, and the average cost of maintenance and operation for 1929 was \$2.15 per ac.

**Animal Industry.** Cattle-raising and sheep-raising are the chief livestock interests. According to the census of 1930 the rank of New Mexico among the states was second in goats, tenth in sheep, and ninth in wool shorn. The state stood twenty-ninth in total value, \$72,281,687, of domestic animals. Among these were cattle, 1,060,327, valued at \$47,925,522; sheep, 2,291,426, \$15,212,166; horses, 141,123, \$5,092,027; mules, 22,935, \$1,216,269; goats, 296,187, \$1,232,982, and swine, 65,592, \$741,406.

Of the cows on farms 527,131 were kept mainly for beef production and 69,898 mainly for milk production. In 1929, 24,490,921 gals. of milk were produced; the total value of dairy products sold was \$2,982,856. The wool clipped, 13,709,145 lbs., was valued at \$3,087,784. Mohair and kid hair from goats amounted to a value of \$304,330. The poultry raised, with a value of \$1,413,152, included chickens, 1,485,609 in number, valued at \$1,099,186, and turkeys, 124,361, \$306,437. Of 6,790,634 doz. chicken eggs produced, valued at \$2,003,137, 3,778,872 doz., with a value of \$1,097,869, were marketed. Honey, amounting to 601,252 lbs. valued at \$70,856, was produced from 15,803 hives.

**Fisheries.** There are no commercial fisheries in New Mexico, but there are many trout streams, especially in the National Forests. In 1930, the state issued 16,925 fishing licenses and received \$137,477 in fees. Six fish hatcheries were operated at a cost of \$46,566 and their output for the last half of 1929 and all of 1930 included 3,603,440 trout and 35,000 bass and other game fish. The U.S. Bureau of Fisheries planted the following, many of them in streams of the National Forests: 137,500 steelhead salmon, 143,500 brook trout, 2,504,000 loch leven trout and 20,000 other game fish.

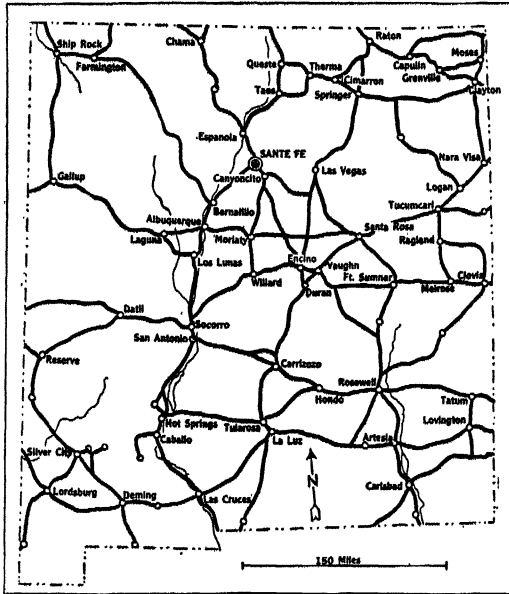
**Transportation.** There is practically no transportation by waterway in New Mexico. In 1930 there were 2,875 mi. of steam railways in the state, about half of which are controlled by the Santa Fé system. Other railroads operating in the state are the Rock Island, the Southern Pacific, the El Paso and North-eastern, the El Paso and Rock Island and the El Paso and Southwestern lines.

The state highway system which includes all the principal through routes, on Jan. 1, 1930, had a total mileage of 50,324, including 2,539 mi. of surfaced roads and 2,196 mi. of improved state highways. The

total highway expenditure during 1929 was \$6,845,605, of which \$6,369,816 was paid by the state and \$475,789 by county and local governments. The state gasoline tax produced an income of \$2,761,887 in 1930 as against \$762,851 in 1926. Total motor ve-

ganizations gave full-time employment to 1,355 men and women whose annual salaries and wages aggregated \$2,330,998.

The total sales of the 4,204 retail stores amounted to \$120,855,221. Sales per store averaged \$28,748; sales per capita were \$285.50.



NEW MEXICO STATE ROADS

hicle registrations were 84,150 in 1930, or nearly double the 49,111 registered in 1925. Buses in operation have also increased rapidly from 210 in 1925 to 396 in 1930, or about 88%. Trucking facilities are also expanding rapidly.

**Manufactures.** As the industrial interests of New Mexico are devoted almost entirely to mining, farming and stock raising, manufactures have been developed only to a slight extent.

According to the Census of 1930 New Mexico with manufactures for 1929 valued at \$21,697,148 stood forty-eighth among the states. Its 250 establishments gave employment to 594 officers and employees, who received \$1,266,139 in salaries, and 4,476 wage earners, who were paid \$5,564,991 in wages. These factories used a total of 23,147 horse power, expended \$720,600 for fuel and power, and \$9,698,849 for materials and supplies, and added by the process of manufacture \$11,277,699 to the value of their output.

In this output there were 15 separately enumerated groups of manufactures, the most important of which in order of value were lumber products, \$4,884,621; petroleum refining, \$2,048,485; printing and publishing, \$1,567,161; bread, \$1,164,690, and cottonseed oil, \$1,133,590. The chief manufacturing city was Albuquerque, with products valued at \$5,715,761.

**Commerce.** According to the census of 1930, there were in 1929 317 wholesaling establishments in New Mexico, with total sales of \$53,546,927. These or-

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive	888	\$28,765,370	23.79
General Mdsc.	872	33,633,847	27.82
Food	1,136	19,611,050	16.24
Lumber & Bldg.	160	9,499,053	7.87
Apparel	148	4,086,335	3.37
Furn. & Household	121	3,690,553	3.06
All other stores	879	21,569,013	17.85

Total, all stores ... 4,204 \$120,855,221

**Finance and Banking.** The assessed value of all taxable property in 1929 was \$325,559,281. The total bonded debt in 1930 amounted to \$11,109,500, against which there was a sinking fund of \$562,596. Total state revenues in 1930 were \$16,979,132; total disbursements, \$15,609,811. The chief sources of income were general property, motor vehicle and gasoline taxes, and Federal road aid. The principal payments were for maintenance expenses of governmental departments, highways and other permanent improvements.

There were 57 banks in New Mexico in 1930. Of these, 27 were national banks and 30 trust companies and state banks. Their total capitalization was \$3,020,000; their surplus and undivided profits, \$1,836,000. Total resources were \$52,592,000, with loans and discounts aggregating \$24,758,000. Demand and time deposits totaled \$42,889,000. Per capita demand and time deposits were \$100.21; per capita savings deposits, \$24.54. The total savings of \$10,501,000 were owned by 19,082 depositors. National bank circulation aggregated \$1,354,000.

**Government.** The legislative body of the state consists of a Senate composed of 24 members and a House of Representatives of 49 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 60 days. The chief executive is the governor elected for a term of two years, but ineligible for reelection, at a salary of \$5,000 per annum. Other executive officers are a lieutenant governor, secretary of state, auditor, treasurer, attorney-general, superintendent of public instruction and commissioner of public lands, all elected for terms of two years. Judicial power is vested in a supreme court, in district courts, probate courts, justices of the peace, and inferior courts. The supreme court consists of three judges elected for terms of eight years at salaries of \$6,000 per annum.

**Social Welfare Institutions.** The state orphans' home is at Santa Fé, a home and training school for mental defectives at Los Lunas, and a girls' welfare home for girls under 18 years of age at Albuquerque. A blind institute is located at Alamogordo and an asylum for the deaf at Santa Fé. At Springer is a

reform school for boys. A miners' hospital is maintained at Raton and an asylum for the insane at Las Vegas. The penitentiary is at Santa Fé.

**Education.** The first schools were mission and parochial schools established by the Spaniards in the latter part of the 16th century. In 1806 in Santa Fé there were 480 children enrolled in such schools. Public schools were founded after the passage of numerous school laws from 1855 to 1872, and by 1875 there were 138 public schools in the territory with 147 teachers. In 1928 there were 1,479 public school buildings. In public kindergarten and elementary schools there were 77,233 pupils, and in secondary schools, 9,787 pupils. All children from 7 to 14 years of age are required by law to attend school the full term. The number of persons from 5 to 20 years of age attending school in 1930 was 102,268, or 67.1% of the population within the ages specified, as compared with 82,167, or 63.8%, in 1920. The number of persons, 10 years and over, unable to read and write in 1930 was 41,845, or 13.3%, as compared with 41,637, or 15.6% in 1920.

The institutions of higher learning are all state-controlled. These include the University of New Mexico, at Albuquerque; the State School of Mines, at Socorro; the College of Agriculture and Mechanic Arts, at State College; The New Mexico Military Institute, at Roswell; the New Mexico Normal University, at Las Vegas; the New Mexico State Teachers College, at Silver City; and a Spanish-American normal school, at El Rito. The Federal government maintains 26 Indian schools.

**Population.** In 1930 New Mexico ranked forty-fourth among the states with a population of 423,317 or an average of 3.5 per sq. mi., an increase of 62,907 or 17.5% over 1920. The population rose from 61,547 in 1850 to 195,310 in 1900, 327,301 in 1910, and 360,350 in 1920. In 1930 there were 331,755 or 78.4% whites, 2,850 or 0.7% Negroes, and 28,941 or 6.8% Indians. Of the whites 323,958 were native-born and 7,797 were foreign-born. The rural population was 316,501 or 74.8% of the total, an increase of 21,111 or 7.1% since 1920; the urban population was 106,816 or 25.2% of the total, an increase of 41,856 or 64.4% since 1920. In 1930 the five largest cities were Albuquerque, 26,570; Clovis, 8,027; Raton, 6,090; Gallup, 5,992; Las Cruces, 5,811.

**Occupations.** In 1930 142,607 persons, or 33.7% of the population, were gainful workers 10 years old or older; 84.5% of these were males and 15.5% were females; 75.8% were native white; 3.3% foreign-born white; 1.0% Negro, and 19.9% other races. Among the chief occupations, with number of workers, were agriculture, 58,900; manufacturing, 23,322; transportation and communication, 13,152; domestic and personal service, 12,246; trade, 11,805; professional service, 9,112, and mining, 7,008.

#### HISTORY

In New Mexico excavations and research in the ruins of ancient pueblos and CLIFF DWELLINGS have

thrown much light on the nature of the people and civilization of the region in pre-historic times. Its picturesque early history is filled with the activities of the Spanish explorers, gold hunters and priests who in the 16th century began to push northward from Mexico into this unknown region. A Franciscan friar, Marcos de Niza, seems to have been the first European to set foot within its borders. In 1539, accompanied by a negro, Estevan, he traversed the country to the Zuni villages. In 1540-2 Coronado and his forces marched northward in search of El Dorado and the Seven Cities of Cibola, going as far as central KANSAS and exploring widely on the way both east and west. During the next half century many other parties roamed through New Mexico, exploring, conquering, searching for gold and establishing missions. Juan de Onate was sent in 1597 as governor to organize the country and carry on more extensive colonizing and Christianizing efforts. Santa Fé, the first permanent settlement, was founded early in the 17th century. Soon afterward was built the adobe governor's palace, still standing, which for 300 years was the residence of Spanish, Mexican and American governors. In 1680 the Pueblo Indians resenting especially the new religion which had been forced upon them rebelled, overcame all the settlements and drove the Spaniards out of the country. Twelve years later Diego de Vargas reconquered the region, new settlers came in and more towns were established, among them Albuquerque in 1706. Early in the 19th century trade began to spring up between New Mexico and the frontier settlements of the United States, and gradually developed into the valuable commerce of the famous Santa Fe Trail. When Mexico achieved independence in 1821, New Mexico became a province of the Republic of Mexico. On the outbreak of the war between the United States and Mexico, American troops under Col. Stephen W. Kearney took formal possession of New Mexico and occupied the capital Aug. 18, 1846. The Territory of New Mexico, including ARIZONA and part of COLORADO, was created in 1850, but its present boundaries were not fixed until 1863. After prolonged efforts to attain statehood, New Mexico, with a population of 327,000, was admitted to the Union Jan. 5, 1912, Santa Fé remaining the capital, as it had been from the first days of colonization more than 300 years before. During the 1870's and 1880's there was serious trouble with the Apache Indians, and some difficulties attended the settlement of the Navajos on reservations. But the settlement of these problems and the building of the transcontinental railroads brought more settlers and the important growth of the cattle business. This period was marked by the lurid happenings, the lawlessness and the activities of the "bad men" which characterized similar stages in the evolution of the western frontier. New Mexico, Republican in national politics since 1920, in 1932 nevertheless gave its three electoral votes to Roosevelt. Arthur Seligman, Democrat, was reelected governor.

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**NEW MEXICO, STATE MUSEUM OF.**

Through an arrangement between the Territory of New Mexico and the Archaeological Institute of America, a school of archaeology was established in Santa Fé in 1909 in the western end of the palace, an edifice where the various governors of Spanish times had resided. The erection of the New Mexico building at the Panama-California Exposition marked the beginning of a new period in the development of the State Museum because the building emphasized the New Mexico style of architecture. It was later reproduced in Santa Fé by the side of the Palace of the Governors. The State Legislature made appropriations, and the museum, including auditorium, art galleries and library, was completed in Nov. 1917. The Museum, through the School of American Research, carries on archaeological investigation. Several important sites, Pecos, Quaray and GRAN QUIVIRA, are the property of the State Museum. The historical and anthropological collections are extensive.

**NEW MEXICO, STATE UNIVERSITY OF,**

at Albuquerque, N.Mex., a coeducational state institution, founded by legislative enactment in 1889 and opened in 1892, with preparatory and normal departments. When New Mexico entered the Union, the institution became the State University of New Mexico. It comprises a College of Arts and Sciences, a College of Engineering and a Graduate Division. The grounds and buildings were valued in 1931 at \$1,000,000. The library of 39,586 volumes contains a special collection of Spanish, Latin, Italian and French volumes, dating from 1533 to 1803. There were 1,034 students in 1931-32, and a faculty of 71 headed by Pres. James F. Zimmerman.

**NEWMAN,** a city and the county seat of Coweta Co. in northwestern Georgia, situated near the Chatahoochee River, and 40 mi. southwest of Atlanta. The Central of Georgia and the Atlanta and West Point railroads serve the city. Included among the diversified industries are textile mills, iron and lumber manufacturing enterprises. It is in a rich agricultural district producing cotton, corn, peaches, peanuts, truck crops and live stock. The city serves as a shipping center for the region. Pop. 1920, 7,037; 1920, 6,386.

**NEW NATIONALISM,** the extension of the scope of the Federal Government for the regulation and restriction of great corporate enterprises and combinations, and to cope with the problems of industrialized society. The phrase was popularized by THEODORE ROOSEVELT in his speaking tour in the summer of 1910.

**NEWNHAM COLLEGE,** a college for women, at Cambridge, England, was founded in 1871 as Merton Hall by Mrs. Anne S. Clough and Henry Sidgwick. In 1876 it was reestablished as Newnham Hall, and in 1880, by an amalgamation of the Newnham Hall Co. and the Association for Promoting the Higher Education of Women of Cambridge, it became Newnham College. The students, numbering about 300, have enjoyed since 1881 all scholastic

privileges of the UNIVERSITY OF CAMBRIDGE, but they are granted certificates of the university, not full degrees. The buildings, designed by Basil Champneys, include Old, Sidgwick, Clough, Peile and College halls. In 1931 the faculty was headed by Miss J. P. Strachey.

**NEW ORLEANS,** the most important city of Louisiana, the gateway to the Mississippi Valley, and the metropolis of the Gulf Coast. One of the greatest centers of foreign and domestic trade in the United States, New Orleans is situated on the east bank of the Mississippi River, 110 mi. above its mouth. The growth of the city has followed a backward curve toward Lake Pontchartrain. A part of the built-up section lies below the high-water mark of both the river and the lake. Consequently, it has been necessary to provide an elaborate but effective system of pumping plants and drainage canals.

New Orleans has one of the safest harbors in the world, with excellent harbor and terminal facilities. It is served by more than 90 steamship lines, which ply to all parts of the world. Twelve trunk railroads and numerous branch lines also enter the city, and additional transportation is provided by four airports and several bus and truck lines, as well as steamers and barges on the Mississippi River.

The city has a number of beautiful parks, and its old French quarter is rich in historical interest. Its well-known landmarks include the Cabildo, where the transfer of the Louisiana Territory took place in 1803, the Ursuline Convent building, completed in 1731, and the old Saint Louis Cathedral.

New Orleans is a world market for cotton, petroleum, tobacco, sugar, molasses, coffee, bananas, lumber, bauxite, rice and cereals. In 1929 its manufactures, which had an approximate value of \$148,000,000, included cotton goods, alcohol, bags, celotex, furniture, clothing, fertilizer, sugar, molasses, coffee, candy, petroleum products, roofing, binder twine and cement. Its 396 wholesalers proper distributed \$323,402,659 worth of merchandise in 1929. The 7,906 retail stores, which did an aggregate business of \$158,295,164 that year, gave full-time employment to 18,920 people.

The principal educational institutions are Tulane University, Loyola University and the Newcomb Memorial College for Women and Dillard Memorial University for Negroes. New Orleans was founded by the French in 1718 and was purchased by the United States in 1803. It was incorporated as a city in 1805. After the War of 1812, its importance as a port grew steadily until for a short time it rivaled New York City. With few exceptions it has been the second port of the United States in foreign commerce every year since 1920. The city was captured by Federal troops in 1862. A commission form of government was adopted in 1912. Pop. 1920, 387,219; 1930, 458,762.

**NEW ORLEANS, BATTLE OF,** Jan. 8, 1815, the most brilliant victory of American infantry in the War of 1812. Devoting greater attention to the war

in America after the European situation had been eased by Napoleon's abdication, Apr. 11, 1814, the British planned a campaign to take possession of the Mississippi basin. In December, 7,000 troops commanded by Maj.-Gen. Sir Edward Pakenham were disembarked at Isle aux Poix in Lake Borgne. Near by they were attacked, Dec. 23, by 2,131 American troops under Gen. Andrew Jackson, in an indecisive battle of comparatively few casualties. Additional regulars under Major-Generals Sir Samuel Gibbs and John Lambert brought to nearly 10,000 the number of British troops which advanced upon New Orleans. Pakenham despatched 1,200 troops to attack an American battery on the right bank, while the main body assailed the American defenses. A motley array of regulars, militia, sailors, frontiersmen, creoles and Negroes, somewhat over 5,000 troops in all, under Jackson overwhelmingly defeated the British regulars. On the right bank the British were successful, but, the main army having been defeated, were unable to pursue the advantage. British casualties numbered 2,036, the American, 71. The battle was fought too late to affect the outcome of the war (*see* GHENT, TREATY OF), but made Jackson a national hero.

**NEW ORLEANS, SIEGE OF**, Apr. 24-29, 1862, the primary naval exploit of the CIVIL WAR. As part of the Federal campaign for the opening of the Mississippi, Flag-Officer Farragut was ordered to take the city of New Orleans, a position of great strategic importance. Entering the Mississippi from the Gulf of Mexico on Apr. 16, Farragut's fleet of 46 vessels exchanged a cannonade with the two Confederate forts, Jackson and St. Philip, which lasted for nearly a week, Apr. 18-23, materially reducing the forts' defenses. Before dawn on Apr. 24 the fleet attempted to run past the forts, successfully completing the maneuver despite a heavy bombardment. Above the forts Farragut encountered the Confederate fleet of 17 vessels, which gave battle; each of the 17 was driven ashore or scuttled to prevent capture. The population of New Orleans was panic-stricken, and the garrison of 3,000 troops withdrew from the city. Anchoring his boats along the levees, Farragut demanded surrender; after futile procrastination, the mayor formally surrendered the town. The Confederacy thereby lost control of Louisiana, was cut off from direct communication with Texas, and suffered a crushing blow to its foreign commerce.

**NEW ORLEANS INDUSTRIAL CANAL**, a waterway in Louisiana, connecting Lake Pontchartrain and the Mississippi River at New Orleans. It is 5.5 mi. long, 300 ft. wide and has a depth of 30 ft. The difference in water level at its extremities is controlled by one lock. This canal was opened Feb. 6, 1923, after a construction period of about five years, costing \$20,000,000. It affords the city of New Orleans an inner harbor on Lake Pontchartrain where private enterprises may lease sites for factories, warehouses and docks. Private developments are excluded from the regular harbor by a clause in the Louisiana Purchase stipulating that the river front at New

Orleans belongs to the public and shall not be exploited for private gain—a provision which has robbed the city of large shipping business. The canal is attracting many new industries and increasing water commerce. In 1929, its sixth year of operation, it transported 949,018 tons of freight.

**NEW ORLEANS UNIVERSITY**, at New Orleans, La., was founded under the auspices of the Methodist Episcopal Church in 1873, for the education of Negroes. It is maintained by the Freedman's Aid Society of the Church. The university includes the College of Liberal Arts, a Teachers' College, Medical College, and schools of Pharmacy and Nursing. The productive funds in 1931 totaled \$105,000. The library had 6,500 volumes. In 1931-32 there were 697 students and a faculty of 30, headed by Pres. Otto E. Kriege. In 1932 Dillard University was organized to merge New Orleans University and STRAIGHT COLLEGE.

**NEW PHILADELPHIA**, a city in eastern Ohio, the county seat of Tuscarawas Co. It is situated on the Tuscarawas River, adjoining Dover and 21 mi. southwest of Canton. The city is served by motor buses and two railroads. Nearby is the Schoenbrun Airport. In the vicinity are coal, iron and clay deposits. The region is good farming country. The city has steel mills and various factories turning out enamelware, electric and vacuum cleaners, shirts, tin cans and patent medicines. In 1929 the value of the manufactured output was approximately \$9,000,000; the retail trade amounted to \$6,477,074. John Knisely founded New Philadelphia in 1804; it was incorporated in 1870. Just southeast of the city are the remains of Schoenbrun, discovered in 1923, believed to be the site of a settlement made by Christian Indians under the leadership of Moravian missionaries. Pop. 1920, 10,718; 1930, 12,365.

**NEWPORT**, a city of Campbell Co., in northern Kentucky, situated at the junction of the Ohio and Licking rivers. Bridges and electric railways connect the city with Cincinnati, O., and Covington, Ky., and it is served also by bus lines and two railroads. Though Newport is a residential suburb of Cincinnati, its manufactures are varied, and were valued, 1927, at \$15,128,727. In 1929 the retail business amounted to \$16,780,368. Pop. 1920, 29,317; 1930, 29,744.

**NEWPORT**, a town in southwestern New Hampshire, the county seat of Sullivan Co. It is situated on the Sugar River, 43 mi. northwest of Concord and is served by bus lines and the Boston and Maine Railroad. Corn and milk are the chief agricultural products. The manufactures are woolens, shoes, overcoats and pine tree products. It is a popular winter and summer resort near Lake Sunapee and Corbin's Park. Newport is said to be the scene of the rhyme about "Mary and her little lamb" and Churchill's novel, *Coniston*. Pop. 1920, 4,109; 1930, 4,659.

**NEWPORT**, a city, port and county seat of Newport Co., Rhode Island, located 30 mi. southeast of Providence. The city is served by the New Haven



Railroad, motor buses, ferries and steamers. Newport is a noted fashionable seaside resort. It has an almost landlocked harbor and a United States naval base and training station. Newport's "Old Town" of homes, churches, forts and other 17th and 18th century memorials still remains; Touro Park preserves the Old Stone Mill, the mill of Longfellow's *The Skeleton in Armor*, attributed to Norse origin; palatial estates and drives are of contrasting interest. The manufactures, including furniture and brass goods, were valued in 1929 at approximately \$4,000,000; the retail business in 1929 amounted to \$17,953,326. Domestic commerce of the harbor amounts to more than 100,000 tons annually. There also are fisheries here.

Founded in 1639 by Massachusetts Bay refugees, the town united eight years later with three other communities to form the colony of Rhode Island and Providence Plantations. It became a city in 1784, a town again three years later, but in 1853 another city charter was secured, lasting until 1906. Then a new charter was issued and until 1900 Newport was the capital of Rhode Island. Pop. 1920, 30,255; 1930, 27,612.

**NEWPORT**, a city of northern Vermont, a port of entry and the county seat of Orleans Co. It is on Lake Memphremagog, about 6 mi. south of the Canadian border. Transportation is afforded by two railroads, buses, and air-lines and lake steamers during the summer. Newport is an all-year resort. It also manufactures and ships maple sugar. It was founded in 1802 and incorporated as a city in 1918. Pop. 1920, 4,976; 1930, 5,094.

**NEWPORT NEWS**, a port and independent city in southeastern Virginia, situated on Hampton Roads and the James River, 7 mi. north of Norfolk. The city shares the facilities of Hampton Roads harbor. The traffic of the channel to Newport News was valued at \$129,602,848 in 1929. The chief exports are coal and tobacco; the imports are copra, pulpwood, manganese and fertilizers. Shipbuilding, commercial and naval, is the chief industry. In 1929 the industrial output was worth about \$25,000,000; the retail trade amounted to \$16,117,412. Newport News is the eastern terminus of the Chesapeake & Ohio Railroad. The city was founded in 1621 and incorporated in 1896. Since 1920 it has had the city manager plan of government. Pop. 1920, 35,596; 1930, 34,417.

**NEW PROVIDENCE**, one of the chief of the Bahama islands, in the British West Indies, about 20 mi. long with its surface, mostly flat, covered with brushwood. Sponges, sisal, tomatoes and shells are the staple products. The island contains NASSAU, the capital of the Bahamas. The British occupied New Providence in 1629 but did not colonize it permanently until much later. Pop. 1931, 19,756.

**NEW RIVER**, a sub-tribe of the North American Indian Shasta, speaking a distinct dialect of that stock. They lived on the branches of the Salmon River in Siskiyou Co., Cal., and at the head of New River.

**NEW ROCHELLE**, a city of Westchester Co., southeastern New York, situated on Long Island Sound, 16 mi. northeast of New York City. It is served by the New York, New Haven & Hartford and New York, Westchester and Boston railroads, and by ferries. New Rochelle is a residential city with many fine homes, and has few local manufactures. Several parks and beaches are within the confines of the city. It is the seat of the College of New Rochelle, a Catholic college for women. Founded by Huguenots in 1688, who named it after the Protestant stronghold in France, New Rochelle was incorporated as a city in 1899. Pop. 1920, 36,213; 1930, 54,000.

**NEW ROCHELLE, COLLEGE OF**, a Catholic institution for women located at New Rochelle, N.Y. Founded in 1904, it was the first Catholic college for women in the state. It is under the direction of the Ursuline Nuns and offers arts and sciences and summer school courses. The grounds and buildings in 1931 were valued at over \$2,000,000. The library contained 25,000 volumes. In 1931-32 there were 804 students and a faculty of 65 headed by Mgr. J. P. Chidwick.

**NEWRY**, a seaport of County Down, Northern Ireland, situated 73 mi. north of Dublin, in a narrow valley on the Newry Water and Newry Canal at the head of Carlingford Lough. A monastery of St. Patrick's day, it was destroyed by the Danes and replaced by a 12th century abbey dissolved in 1689. The Norman castle, erected by De Courci, was alternately destroyed and rebuilt in the frequent wars that reduced the town to poverty. To-day Newry is clean and well-built, admitting 3,000 ton vessels to Victoria Basin, and having rail connections with the deep-water harbor of Greenore. Distilling and brewing are the chief local industries. Pop. 1926, 12,226.

**NEW SIBERIA ISLANDS**, in the Arctic Ocean, lying off the northern coast of Siberia and forming part of the Yakutsk Socialist Soviet Republic. They comprise a total area of about 10,000 sq. mi. and the largest of them are Kotelnai, New Siberia and Thaddeus. There are animal and vegetable fossil remains. Siberian natives use the islands for hunting expeditions but due to the severe climate they are not adapted for permanent settlements.

**NEW SOUTH WALES**, a constituent state of the Commonwealth of Australia, in the southeastern part of the continent, bounded on the south by Victoria, on the north by Queensland, on the east by the Pacific Ocean, and on the west by South Australia. With an area of 309,432 sq. mi. the state lies wholly in the temperate zone.

The population of New South Wales has grown from 1,377,648 in 1901 and 2,099,763 in 1921 to 2,462,421 in 1929. About 68% of the population is concentrated in urban districts. The capital is Sydney; other leading cities are Newcastle, Broken Hill, Lithgow, Goulburn, Maitland, Bathurst and Lismore.

**Surface Features.** The coastal district is traversed by portions of the Great Dividing Range. The

highest peaks are Kosciusko, 7,328 ft. high, and Townsend, 7,266 ft. On the west side of the watershed are the rivers Murray, Murrumbidgee, Lachland and Darling.

**Agriculture.** The narrow belt of coastal land is very rich along the numerous short rivers, the rainfall is good, and there is much dairying. The western elevated slope of the coastal range constitutes the principal agricultural lands. It is a vast area which has a rainfall of between 16 and 25 in. per annum. In the other sections of the state, the success of agriculture is always uncertain. The raising of sheep and cattle is more profitable, since the natural grasses will withstand the vicissitudes of the climate. The principal crops are wheat, maize, oats, rice and hay. In 1929 the state had 52,700,000 sheep, 2,848,654 cattle, 598,377 horses, and 301,819 pigs.

**Minerals.** The most important minerals are coal, copper, silver, lead, zinc, tin, gold and iron. About 55% of the total value of the mineral output is derived from coal; this amounted to \$41,300,000 in 1928. The output of gold has declined in recent years.

**Commerce.** The chief exports are wool, butter, wheat, flour, fruits, frozen meats, hides and skins, leather and coal. Imports include metal manufactures, machinery, wearing apparel, textiles, rubber, paper and stationery.

**Education and Government.** The state maintains a system of national education, free and compulsory for children between 7 and 14 years of age. The University of Sydney, with 5 affiliated colleges, is supported by private and government grants. In 1928 the state expenditure for education was \$26,250,000.

New South Wales was first colonized in 1788. A partly elective legislature was established in 1843, and the New Constitution Bill was approved by the British government twelve years later. The present constitution was founded in 1902 after New South Wales joined the other Australian states to form the Commonwealth. The legislative power of the state is vested in a Parliament of two houses, the Legislative Council and the Legislative Assembly. Members of the Council are appointed for life by the Crown. The Assembly has 90 elected members. Pop. 1921, 2,100,371.

**NEWSPAPER,** a publication containing chiefly news of current events, feature articles and advertising, and issued at fixed intervals, usually daily, semi-weekly or weekly.

The ancient Romans reported notable public affairs in their *Acta Diurna*, *Acta Publica* and *Acta Senatus*. Similar reports appeared in China in the 7th century, and in 1340 China printed the first newspaper, *The Peking Gazette*. The first European newspaper is generally acknowledged to have been the German *Avisa Relation Oder Zeitung*, published in 1609. England's first genuine newspaper was *News of the Present Week*, issued in 1622 by Thomas Archer and Nathaniel Butter. (See also SPECTATOR; TATLER.) The London *Times*, the outstanding British paper

to-day, was founded in 1785 by John Walter. The oldest existing French newspaper is the *Gazette de France*, dating from 1631. Germany's oldest is the *Frankfurter Journal*, founded 1615.

The three earliest American newspapers were the Boston *News-Letter*, founded by John Campbell in 1704, the Boston *Gazette*, issued by William Brooker in 1719, and the *American Weekly Mercury*, established in 1719 by Andrew Bradford. New York City's first paper, 1725, was the New York *Gazette*. By 1740 there were 11 American newspapers. The first American daily, the *Pennsylvania Packet and General Advertiser*, came out in 1784. The Pittsburgh *Gazette*, 1786, was the first paper published west of the Alleghenies.

Benjamin Day offered America its first penny newspaper in 1833 when he established the New York *Sun*, which immediately evoked a competitor, the New York *Morning Post*. The oldest existing American newspaper in 1931 was The New York *Evening Post*, 1801, among whose founders were ALEXANDER HAMILTON and JOHN HAY.

In 19th century American journalism, four figures tower above all others. Most remarkable among these was JAMES GORDON BENNETT, founder of the New York *Herald*, 1835, and the father of journalistic sensationalism, personal appeal, large scale advertising and high-pressure circulation. Second in conspicuity was HORACE GREELEY, who founded the New York *Tribune*, 1841. The energetic CHARLES A. DANA rose to prominence through the New York *Sun*, which he purchased in 1868. By founding the New York *Times*, 1851, Henry J. Raymond achieved greatness. Three celebrities of later newspaperdom were JOSEPH PULITZER, who purchased the New York *World* in 1883 (defunct, 1930); WILLIAM RANDOLPH HEARST, who swooped down upon New York in 1896; and ADOLPH OCHS, publisher since 1896 of the New York *Times*.

Outside New York may be mentioned such important newspapers as the Baltimore *Sun*, 1837, the Boston *Transcript*, 1830, the Chicago *Tribune*, 1847, the Cleveland *Plain Dealer*, 1841, the Cincinnati *Enquirer*, 1842, the Detroit *Free Press*, 1835, the Emporia *Gazette*, 1890, the Kansas City *Star*, 1880, the Los Angeles *Times*, 1881, the Louisville *Courier-Journal*, 1867, and the San Francisco *Call*, 1856. This by no means exhausts the list of powerful American newspapers, but is merely indicative of their wide geographical range.

The Sunday newspaper, which first appeared in America about 1865, consists of various separate sections that can be made up considerably in advance of publication. Tabloid papers, sensational and amazingly popular, sprang into life between 1919 and 1930. Newspapers depend largely upon advertising for profits, and advertising depends, in turn, on circulation.

In the United States in 1931 there were approximately 14,000 newspapers of all classes, 378 morning dailies, 1,548 evening dailies and 521 Sunday papers.

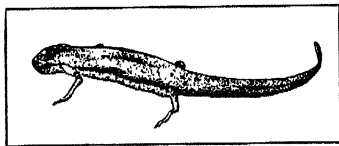
Foreign newspapers in the United States had a circulation of approximately 2,000,000 per issue.

**NEW STARS**, temporary stars, or *NOVAE*, the name given to stars that appear suddenly in the sky.

**NEWSTEAD ABBEY**, the picturesque mansion and estate once owned by LORD BYRON, situated 8 mi. from Nottingham, near SHERWOOD FOREST, Nottinghamshire, England. After Scott's ABBOTSFORD, it is in appearance perhaps the most romantic mansion associated with any English poet. The vast stone structure occupies nearly the site of an Augustinian priory or abbey founded in 1170, the ruins of which and its lands were bestowed by Henry VIII upon Sir John Byron in 1538. Lord Byron, the poet—inheriting through his great-uncle in 1798—established himself at Newstead in 1808, but never lived there for long, and in 1817 sold the estate for about \$450,000 to Colonel Wildman. Of greatest interest in the mansion itself are Byron's study, the library, the "great hall," and the various state apartments. On the lawn one sees the grave of Boatswain, the poet's favorite dog. Byron's grave is at Hucknall Torkard, the parish church, 3 mi. away.

In 1930 Sir Julian Cahn purchased Newstead Abbey from C. I. Fraser, the owner since 1912, and presented it as a memorial museum to the nation.

**NEWT**, the common name for members of a genus (*Molge* or *Triton*) of tailed amphibians. They look much like their near relatives, the true salamanders, except that their tails are flatter. Unlike these relatives, however, they are aquatic or semi-aquatic, invariably living in the water during the breeding sea-



CRIMSON-SPOTTED NEWT

son. The fish-like larvæ have three pairs of feathery external gills.

There are about 20 species of newts, mostly found in the Old World. Only two kinds live in North America. The crimson-spotted newt (*Triton* or *Diemyctylus viridescens*) is common in the northeastern part of the United States. It is a small animal, about 3½ in. long, greenish-brown above, with two rows of crimson dots, and orange spotted with black below. The large newt (*Triton torosus*) of western North America sometimes attains a length of 6 in.

**NEW THOUGHT**, in religion, a movement somewhat philosophical and mystical. It is an attitude of mind rather than a specific cult, being in fact quite opposed to creeds and placing its emphasis on principles. Among these principles are the immanence of God and the brotherhood of man. Man is regarded as a part of nature, and nature is thought of in scientific terms, particular emphasis being placed on the law of cause and effect. This law is adopted also in

the mental realm, where it becomes a central principle in the belief of its followers. This is carried to such an extent that much stress is often placed on mental healing. Right thinking, according to New Thought, is the key that unlocks the universe; the power that can rid it of all disagreeable and ugly features.

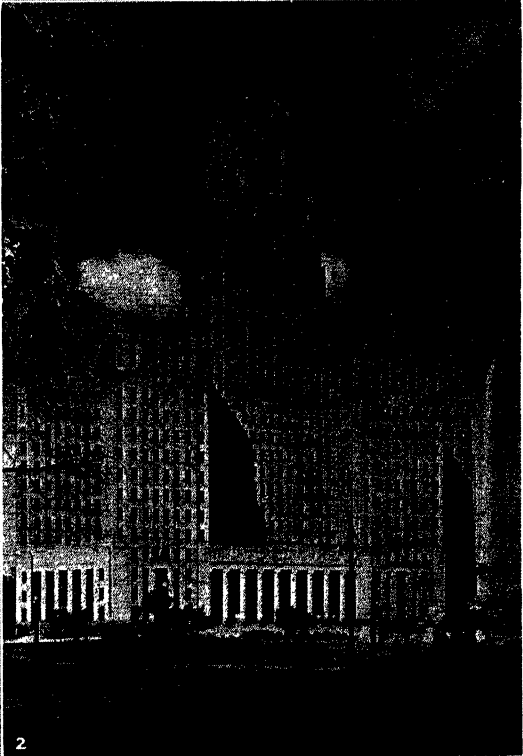
**NEWTON, SIR ISAAC** (1642-1727), English mathematician, physicist and astronomer, was born at Woolsthorpe, Lincolnshire, Dec. 25, 1642. He was taken out of school at the age of 15, and set to work on a farm, but his conspicuous lack of ability for this work earned him the right to go back to school, and eventually to Trinity College, Cambridge, in 1661. He was graduated in 1665, took his M.A. in 1668, in the following year was made Lucasian professor of mathematics at Cambridge, and in 1671 was elected a Fellow of the Royal Society. He sat in the convention parliament of 1689-1690, was made master of the mint in 1699, and took his seat in parliament for Cambridge University in 1701. He was knighted in 1705.

Newton has rightly been acclaimed as the greatest universal genius the world has ever produced. While still in college he developed the binomial theorem, and as early as 1665 conceived the first ideas on his theory of fluxions which later grew into the differential and integral calculus. At about the same time he made his celebrated experiments on the unequal refrangibility of light of different colors, which convinced him, although erroneously, that it was impossible to make an achromatic lens system. This led to his invention of the reflecting telescope in 1668.

His outstanding achievement, and the greatest contribution of any single man was his law of gravitation. He had long been convinced that J. KEPLER's laws of planetary motion could be explained by assuming the existence of an attractive force inversely proportional to the square of the distance, and it is said that an apple falling off a tree first gave him the idea of seeking for gravitation as a universal law of nature. His first attempt to prove that the same law governs falling bodies on earth, and the motion of planets failed because the value at his disposal for the diameter of the earth was erroneous. When the new measures of Picard became known around 1680, Newton at once took up the problem again, and solved it. E. HALLEY came to hear of it in 1684, and after some opposition prevailed upon Newton to publish his results, first in *De Motu Corporum*, later, in 1687, more fully in his immortal classic, *Philosophia Naturalis Principia Mathematica*. He died at Kensington, Mar. 20, 1727.

**NEWTON**, a city in eastern Iowa, the county seat of Jasper Co., situated 33 mi. east of Des Moines. Bus lines, airplanes and two railroads serve the city. The most important manufactures are washing machines, but there are also flour mills, foundries, machine shops and wood-working factories with a total annual production averaging about \$50,000,000. The retail trade in 1929 amounted to \$7,378,268. Newton was settled in 1846. Pop. 1920, 6,627; 1930, 11,560.

## NEW YORK



1. FELLOWSCHAFTS' PHOTO, ALBANY; 2, 3, COURTESY CHAMBER OF COMMERCE, BUFFALO; 4. CORNELL UNIVERSITY

### GOVERNMENTAL AND EDUCATIONAL BUILDINGS AND NIAGARA FALLS, NEW YORK.

1. State Capitol at Albany. 2. City Hall of Buffalo, dedicated in 1932, one of the largest civic structures in the United States. 3. View of the American side of Niagara

Falls. 4. Campus of Cornell University, Ithaca. Willard Straight Hall is in the left foreground and the Library, with a pointed tower, in the left center.

# NEW YORK

Area 49,204 sq. m.  
Pop. 12,588,006

## PRINCIPAL CITIES

Pop.—Thousands

127 Albany... N 23

35 Amsterdam... N 22

37 Auburn... M 13

17 Batavia... M 7

12 Beacon... D 5

77 Binghamton... O 16

573 Buffalo... N 4

8 Canandaigua... M 10

23 Cohoes... N 23

16 Cortland... Q 15

15 Cortland... M 5

20 Dunkirk... O 2

42 Elmira... Q 12

16 Endicott... Q 15

16 Floral Park... H 6

16 Freeport... Q 17

12 Fulton... K 13

7 Garden City... H 7

16 Geneva... M 11

11 Glen Cove... G 6

19 Glens Falls... K 24

23 Gloversville... M 21

7 Hastings-on-Hudson... G 5

13 Hempstead... H 7

16 Herkimer... L 19

16 Hornell... P 9

12 Hudson... P 24

10 Ithaca... M 19

21 Ithaca... P 13

45 Jamestown... Q 3

14 Johnson City... R 15

11 Johnstown... M 21

16 Kenmore... M 4

28 Kingston... R 22

24 Lackawanna... N 4

7 Lancaster... M 5

11 Little Falls... L 20

23 Lockport... L 5

12 Lynbrook... Q 21

9 Malone... Q 21

12 Mamaroneck... G 6

11 Massena... C 19

8 Mechanicville... M 23

21 Middletown... E 3

8 Mineola... H 6

62 Mt. Vernon... G 6

8 Newark... M 11

31 Newburgh... D 5

64 New Rochelle... G 6

6930 New York... I 5

1265 Bronx

2560 Brooklyn

1867 Manhattan

1079 Queens

158 Richmond

76 Niagara Falls

14 North Tonawanda... L 5

8 Norwich... O 17

17 Ogdensburg... L 17

22 Olean... R 6

11 Oneida... L 16

13 Oneonta... P 19

9 Ossining... F 6

23 Oswego... K 13

7 Patchogue... H 9

13 Peekskill... E 5

13 Plattsburg... D 24

23 Port Chester... G 7

10 Port Jervis... E 3

40 Poughkeepsie... C 6

11 Rensselaer... O 24

328 Rochester... L 9

14 Rockville Center... I 7

32 Rome... L 17

9 Rye... G 6

8 Sag Harbor... F 12

10 Salamanca... K 13

8 Saranac Lake... F 22

13 Saratoga Springs... L 23

96 Schenectady... M 22

7 Scotia... M 23

8 Solvay... M 14

209 Syracuse... M 15

7 Tarrytown... F 6

13 Tonawanda... L 4

73 Troy... N 24

102 Utica... L 18

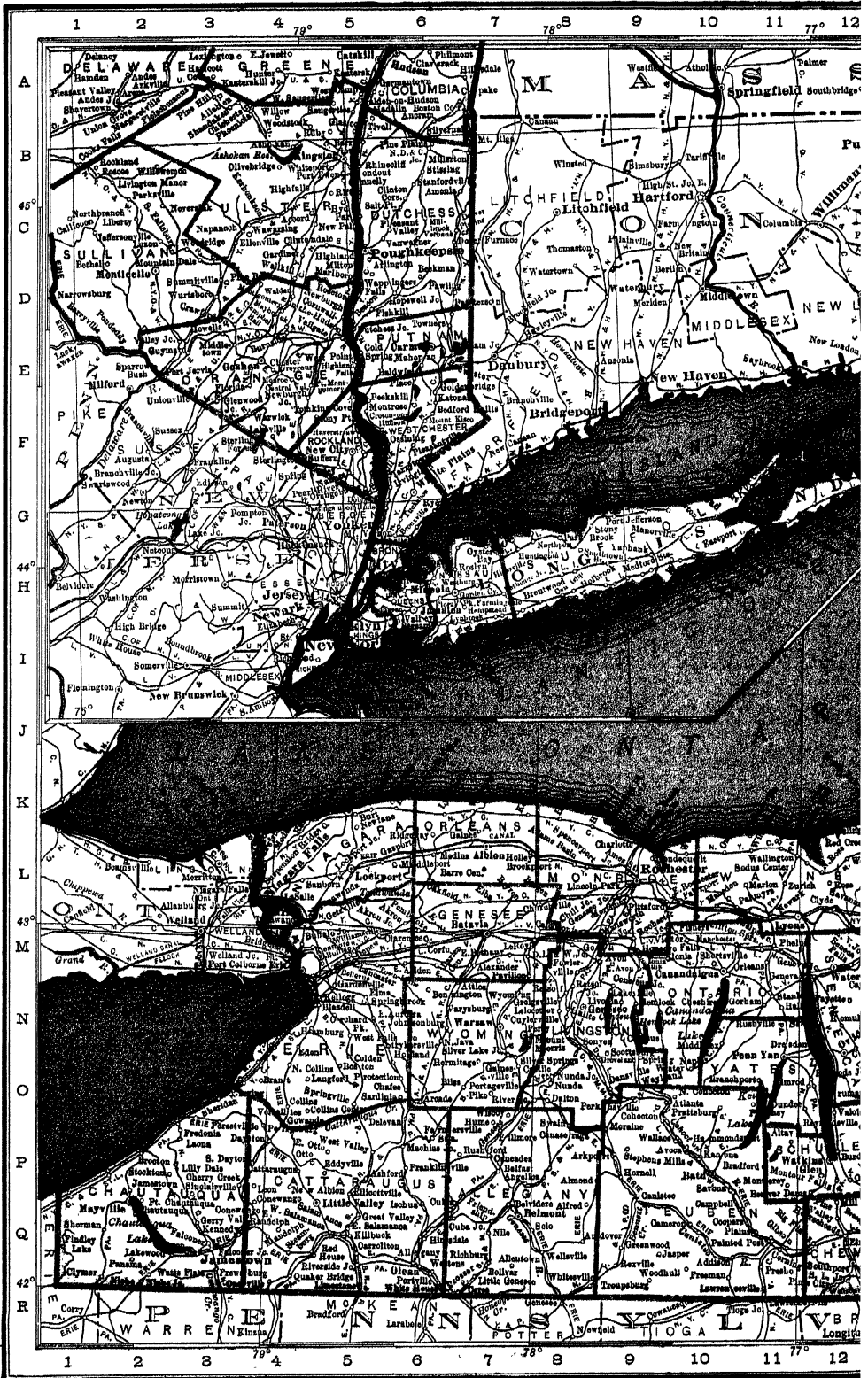
12 Valley Stream... H 6

32 Watertown... H 15

16 Watervliet... N 23

36 White Plains... G 6

135 Yonkers... G 5

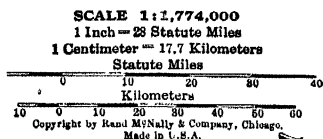


**SCALE 1:1,774,000**  
**1 inch = 28 Statute Miles**  
**1 Centimeter = 17.7 Kilometers**

Statute Miles

Kilometers

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**NEWTON**, a city in south central Kansas, the county seat of Harvey Co., situated 26 mi. north of Wichita. The Atchison, Topeka and Santa Fé and Missouri Pacific railroads make the city a shipping center for the grain and live stock raised in the vicinity. Newton has an 80-acre airport. The Santa Fé railroad shops, flour and alfalfa mills, a creamery, bottle works and hatchery provide employment for a large part of the inhabitants. Bethel College was founded here by the Mennonites who settled here in 1871. Newton is at the end of the Chisholm Cattle Trail from Texas. Pop. 1920, 9,781; 1930, 11,034.

**NEWTON**, a city of eastern Massachusetts, in Middlesex Co., on the Charles River about 7 mi. southwest of Boston. It is on the Boston & Albany railroad. Newton is made up of Newton, Newton Center, Newtonville, Auburndale and seven other villages. A fine residential suburb of Boston, it is also a manufacturing city producing chiefly fire alarms, railway signals, curtains, hosiery and cordage. In 1929 the total output of manufactures was \$18,542,357. Newton is the seat of Lasell Seminary for Girls, the Mt. Ida School for Girls, and a Baptist theological seminary. The city was settled in 1631 and received its charter of incorporation in 1688. An interesting monument is the Eliot memorial erected to commemorate the first Indian church, founded by John Eliot in 1646. Pop. 1920, 46,054; 1930, 65,276.

**NEWTON**, a town and the county seat of Sussex Co., N.J., located on the Lackawanna Railroad, 40 mi. northwest of Newark. It is the trading center for a prosperous agricultural and dairy district and for an area of mountain lake resorts. It has a number of important manufacturing establishments, the products including shoes, clothing, brushes and paper boxes. Pop. 1920, 4,125; 1930, 5,401.

**NEW ULM**, a city in southern Minnesota, situated on the Minnesota River, 88 mi. southwest of Minneapolis. It is the county seat of Brown Co., and is served by bus and truck lines, and two railroads. There is also an airport. Grain is the chief crop of the region and the city is a market center and has such industries as flour milling and cereal, overall, and concrete manufacturing. New Ulm was founded in 1854 and incorporated in 1879. It was the scene of the Sioux uprising in 1862. Dr. Martin Luther's College is located here. Pop. 1920, 6,745; 1930, 7,308.

**NEW WATERFORD**, town of Cape Breton Co., Nova Scotia, Canada, situated on the Atlantic coast, about 15 mi. east of Sydney, and 220 mi. northeast of Halifax. New Waterford is a trade and banking center for the adjacent mining and industrial areas. Pop. 1921, 5,615; 1931, 7,745.

**NEW WESTMINSTER**, a city of British Columbia, Canada, situated on the Fraser River, 15 mi. from its mouth, and 12 mi. east of Vancouver. With an excellent, all-year-round harbor supplemented by adequate rail connections, there is a heavy shipping traffic, particularly in timber, mining, fruit and dairy products of the region. The city is growing as an indus-

trial center for lumber products and paper manufacture, and has shipbuilding yards, chemical works, fisheries and canneries. A large waterfront freight terminal with storage and wharf accommodations has been completed. New Westminster, founded in 1859, was an early capital of British Columbia. Pop. 1921, 14,495; 1931, 17,524.

**NEW WINDSOR**, municipal borough, England. See WINDSOR.

**NEW YEAR'S DAY**, the first day of the new year, variously celebrated throughout the world. The early Egyptians, Phoenicians and Persians observed Sept. 21. The Greeks, until the 5th century B.C., observed Dec. 21, as did the Romans, who later changed it to Jan. 1. The Jewish civil year began from Sept. 6 to Oct. 5, while the religious year began on Mar. 23. The Chinese New Year is celebrated from Feb. 8 to 11, and the Hindus have adopted Apr. 13. While the countries of the Western Christian churches now celebrate Jan. 1, the Eastern churches continue to use Jan. 14. The Mohammedan *Nau Roz* begins on Mar. 23. For most medieval Christians, Mar. 25 was New Year's Day. Anglo-Saxon England, after observing Dec. 25 as New Year's, changed at William the Conqueror's command to the Roman Jan. 1, but later changed again to Mar. 25. In 1582 most Catholic countries, obeying the calendar reform of Gregory XIII, adopted Jan. 1, followed by the German and Scandinavian countries in 1700, but England waited until 1753 before adopting Jan. 1 as the settled date for New Year's Day.

**NEW YORK**, one of the original thirteen states of the Union, since about 1820 ranking first both in population and in wealth whence its popular name the "Empire State." It is situated between 40° 30' and 45° N. lat. and 71° 51' and 79° 46' W. long. On the north it is bounded by the Canadian provinces of Ontario and Quebec, from the former of which it is separated by Lake Ontario and the St. Lawrence River. Vermont, Massachusetts, and Connecticut form the eastern boundary. The Atlantic Ocean, New Jersey and Pennsylvania bound it on the south and Lake Erie and Pennsylvania on the western border. New York comprises an area of 49,204 sq. mi., including Long Island and Staten Island. The state also embraces over 3,100 sq. mi. of water surface in lakes Ontario and Erie. In size it ranks twenty-ninth among the states of the Union.

**Surface Features.** Because of its irregular outline, New York embraces sections of several different topographical regions. The mean elevation of the state is 1,000 ft. above sea level. That part north of the Mohawk River and west of the Hudson is an extension of the Laurentian uplands of Canada,



NEW YORK STATE SEAL



which has been eroded into a rugged mass of ridges and valleys known as the Adirondack Mountains. This group has 39 peaks over 4,000 ft. high, mostly in Essex Co., of which the two highest are Algonquin Peak, 5,112 ft. and Mt. Marcy, 5,344 ft. The latter is the highest elevation in the state. Of the many lakes in this district, the largest are Lake George, Long Lake, Saranac and Tupper lakes.

The Mohawk valley in eastern New York and the lake shore plains in western New York constitute a continuous strip of lowlands marked by low ranges of glacial moraines and drumlins of glacial till. To the south is the Allegheny plateau, the northern outline of which is a cuesta following the Lake Erie shoreline to Buffalo and thence eastward along a line running through Batavia, Syracuse and Utica to the Helderberg Mountain directly south of Albany. This upland is exceedingly varied by glacial processes. In the western part the Genesee River flows through a sandstone gorge 20 mi. long and 350 ft. deep in which are several cascades. East of this river are the series of 13 Finger Lakes, chief of which are Keuka, Seneca, Cayuga, Oswego and Oneida, which drain into Lake Ontario. These are like small river canyons filled with water by tributary streams, many of which fall over rocky ledges to reach the lakes. Taughannock Falls on Lake Cayuga, 215 ft. high, is the highest single fall east of the Rockies. At the eastern terminal of the Allegheny plateau are the Catskill Mountains, generally 3,500 ft. high, covering an area of 1,000 sq. mi.

The Ramapo Mountains of New Jersey extend northeastward into New York and, under the name of Hudson highlands, cross the Hudson River just below Newburgh. From here they continue northward on the east side of the Hudson where they are called the Taconic Mountains.

Barely separated from the mainland of the state is Long Island which is structurally a northern extension of the coastal province of New Jersey. It is throughout a sandy lowland with an average elevation of 70 ft. above sea level.

The drainage of the state is divided among the Hudson River and its tributary, the Mohawk; the St. Lawrence River and Lake Ontario; and the Delaware and Susquehanna rivers.

**Climate.** The climate is variable and characterized by extremes. However, Long Island, the lower Hudson valley and the Lake Ontario lowlands possess a distinctly milder climate than the more elevated portions of the interior. The mean annual temperature is 46.2° F., ranging from 52.3° F., with an average of 30.9° F. for Jan. and 73.8° F. for July, at New York City to 47° F., with an average of 24.6° F. for January and 69.8° F. for July, at Buffalo to less than 40° F. in the high Adirondacks. During the period 1890-1930 the highest temperature recorded in the state was 105° F. and the lowest -46° F. The average annual precipitation is 39.4 in. including 69.3 in. of snow, ranging from 43 in. at New York City, including 34.9 in. of snow, to 36

in. at Buffalo, including 74.4 in. of snow. At Albany and at Buffalo the average growing season is 176 days; at Canton, north of the Adirondacks, it is 143 days.

**Forests and Parks.** Of a land area of 30,498,560 acres, approximately 30,080,000 acres were originally forested. The forest area, in a 1931 estimate, is 12,004,338 acres or 40% of the land area. Large forests make up 7,568,193 acres of this total and 4,436,145 acres are farm woodlots. According to the Conservation Department of the State of New York approximately 50% of merchantable timber is in the Adirondack region of which 25% is on state land. New York presents a complex of forest types. The principal trees are oak, maple, chestnut, beech, birch, basswood, elm, ash, white pine and hemlock. With ascending altitude red spruce, balsam, paper birch and mountain ash are found and dwarf red spruce, white spruce, balsam fir and paper birch on the mountain summits. Definite steps for forest preservation were first taken in 1885 with the creation of the State Forest Commission for the protection of forests of the Adirondack region. This commission was later merged with the Division of Lands and Forestry under the Department of Conservation. In 1931 State Forest Preserves in the Adirondack and Catskill mountains covered 2,193,600 acres. Reforestation is more intensive than in any other state in the Union and includes several hundred town, village, city, county and school district forests for which trees have been supplied by the Conservation Commission. The largest single plantation is the Roosevelt Forest containing over 2,000,000 trees. The Gene Stratton Porter and Clara Barton forests each have 10,000 trees.

New York also has the largest acreage and greatest number of preserves in state parks, forests, and similar areas. For facility in administration these have been divided into eleven park regions each under a commission. 1. The county of Niagara which includes NIAGARA RESERVATION. 2. Chautauqua, Allegany and portions of Cattaraugus County containing ALLEGANY STATE PARK and Cuba Reservation. 3. Orleans, Genesee, Monroe, Wyoming and Livingston counties in the western portion of the state under the administration of the Letchworth Park Committee of the American Scenic and Historic Preservation Society and embracing LETCHWORTH PARK. 4. The Finger Lakes State Park Commission administers the fourth region which includes Wayne, Ontario, Steuben, Chemung, Schuyler, Yates, Tioga, Tompkins and Seneca counties and a part of Cayuga County. Eight parks, including BUTTERMILK FALLS, ENFIELD GLEN, Cayuga Lake and Watkins Glen are in this region. 5. The Central New York State Park Commission has charge of six parks in Oswego, Onondaga, Madison, Cortland, Chenango, Otsego, Broome and Cayuga counties. These parks include many beautiful lakes with camp sites and other recreational facilities. 6. This region, administered by the Division of Lands and Waters of the Conservation

Commission includes ADIRONDACK PARK, CATSKILL PARK and LAKE GEORGE all in the Forest Preserve area; also Saratoga Springs, the St. Lawrence Reservation and Hearthstone and John Boyd Thatcher parks. 7. Columbia, Dutchess, Putnam and Rensselaer counties contain TACONIC STATE PARK which forms the New York nucleus of a tri-state park in New York, Massachusetts and Connecticut. 8. Orange and Rockland counties contain PALISADES INTERSTATE PARK. 9. Westchester County with the Westchester County Park Commission acting as agent for the state has a splendid system of 12 parks including MOHANSIC, Rye Beach and Mansuring Island, Croton Point, Silver Lake and Poundridge Reservation; also 9 parkways including the Saw Mill River and Hutchinson River developments. 10. Nassau and Suffolk counties under the jurisdiction of the Long Island Park Commission contain 17 parks including Fire Island, Hempstead Lake, Montauk Point, Deer Range and Jones Beach. 11. Erie County and part of Cattaraugus County under the administration of the Erie County Park Commission acting as agent for the state has five parks.

Twenty-three state monuments or historical parks formerly under the administration of the New York State Museum and the State Council of Parks have been placed under the jurisdiction of the region in which they are located. These include Washington's headquarters at Newburgh, Saratoga battlefield at Schuylerville and Clinton House, occupied as an executive mansion by George Clinton, the first Governor of New York. State Monuments under the jurisdiction of the American Scenic and Historic Preservation Society include Philipse Manor Hall, Andre Monument, John William Draper Park and Hamilton Grange. FORT NIAGARA, FORT WOOD, and WHITE PLAINS BATTLEFIELD are National Monuments under the administration of the War Department.

**Minerals and Mining.** New York possesses extensive and varied mineral resources, though none of major economic importance. Among these are valuable deposits of clays and building stone. Extensive beds of iron ore, occurring as magnetite and hematite, are found from the Adirondacks to the western districts. Large beds of gypsum and rock salt occur south of Lake Ontario. Petroleum and natural gas are obtained in considerable amounts in the southwestern counties. The state is the chief producer of fibrous talc, mined in St. Lawrence county, and of various minor minerals, as diatomite, emery, feldspar, abrasive garnet and silica.

With mineral productions in 1929 amounting to \$109,361,349, New York stood fourteenth among the states; ranking first in gypsum, aluminum, sand and gravel, emery and talc; second in salt, third in slate, fourth in limestone, and fifth in iron ore and marble.

In order of value the principal items of output were clay products, \$17,661,711; stone, 11,693,640 tons valued at \$15,895,914; cement, 10,742,992 bbls., \$15,597,868; sand and gravel, 21,061,094 tons, \$14,919,658; petroleum, 3,377,000 bbls., \$13,170,000; gypsum, 1,284,

338 tons, \$8,339,852; salt, 2,194,590 tons, \$6,470,051; natural gas, 8,387,000 M cu. ft., \$5,538,000; iron ore, 875,564 tons, \$3,941,985; talc, 109,543 tons, \$1,439,272; and zinc, 10,250 tons, \$1,353,000.

In 1929 298 mines and quarries gave employment to 7,213 persons who received \$12,566,809 in salaries and wages.

**Soil.** In the valleys of the larger rivers and along the lake shores a rich alluvium is found, constituting the richest soils in New York. With the exception of the foregoing most of the state is covered by glacial drift deposits of varying composition and fertility. In western New York especially, and widely also in other parts of the state except in the mountains, a clay formed by the glacial grinding of shale and limestone is the predominant soil. In the eastern sections there are limited areas of clay soil produced by the disintegration of slate. In the northern part of the state soils range from sandy loams to gravelly soils containing broken fragments of limestone.

**Agriculture.** The principal crops are hay and grain, utilized extensively in the dairy industry. Of nearly equal importance are vegetables and fruits grown for the city markets.

In 1930 17,979,633 ac. or 59.0% of the entire land area was in farms, 159,806 in number, with an average size per farm of 112.5 ac. and an average value per acre of \$73.19. Of the farm area 8,154,315 ac. or 45% was crop land; 7,300,145 ac. or 41%, pasture land; and 1,684,798 ac. or 9%, woodland. The total value of farm property was \$1,711,762,052, of which \$1,315,904,741 was represented by land and buildings; \$173,606,369, by implements and machinery; and \$222,250,942, by domestic animals.

According to the census of 1930 New York produced in 1929 field crops to the value of \$197,483,533, ranking eighteenth among the states. It stood second in vegetables harvested for sale, ranking first in cabbages and sweet corn, second in onions, third in potatoes, beans, peas, lettuce and cucumbers, fourth in celery, and ninth in tomatoes. The state ranked first in currants, second in apples, grapes and raspberries, fourth in pears and cherries, sixth in plums and prunes, and thirteenth in peaches. The state also stood second in buckwheat and fourth in hay. In value the chief crops were hay and forage \$77,571,946, vegetables \$60,888,595, grains \$30,398,721, and fruits \$27,179,321.

Of the hay crop of 5,154,974 tons, timothy and clover furnished 4,245,208 tons or 82%.

Potatoes, 21,445,436 bu. grown on 212,400 ac., were valued at \$32,409,044. Other important vegetables were cabbages \$4,200,366, tomatoes \$2,349,245, sweet corn \$2,048,136, celery \$2,030,904, dry onions \$2,001,105, beans \$1,402,132, peas \$1,371,991, lettuce \$1,353,536, cauliflower \$933,339, cucumbers \$684,790, carrots \$663,156, and spinach \$620,278.

The grains included oats, 12,775,284 bu.; corn, of which 4,283,820 bu. were harvested for grain and 2,923,935 tons cut for silage; wheat, 3,817,648 bu.; buckwheat, 2,452,508 bu., and barley, 1,548,560 bu.

The principal fruit crops were apples, 13,991,729 bu.; peaches, 1,004,534 bu.; pears, 701,237 bu.; cherries, 523,744 bu.; plums and prunes, 214,437 bu.; grapes, 154,334,790 lbs.; strawberries, 7,883,204 qts.; raspberries, 7,173,706 qts., and currants, 2,469,941 qts.

Farm products sold by cooperative marketing rose from \$44,906,247 in 1919 to \$52,623,182 in 1929, and farm supplies purchased by this method from \$2,270,976 to \$11,407,972. Farm machinery and equipment in 1930 included 141,916 automobiles, 58,974 motor trucks, 40,369 tractors, 24,342 electric motors, and 64,723 stationary gas engines.

**Animal Industry.** Dairying is the outstanding livestock interest. According to the census of 1930, New York stood fourth among the states in number of milk cows on farms, third in gallons of milk produced, and second in dairy products sold. The state ranked ninth in total value, \$222,250,942, of domestic animals on farms. Among these were 2,220,139 cattle reported from 131,919 farms or 83% of all farms in the state and valued at \$159,793,327; horses, 320,460 in number valued at \$38,795,948; mules, 5,849, \$680,996; sheep, 618,075, \$5,670,783, and swine, 220,826, \$3,210,289.

Of the cows on farms, 1,404,739 were kept mainly for milk production and 20,245 mainly for beef production. In 1929, 800,523,979 gals. of milk were produced; the total value of dairy products sold was \$168,091,055, including \$159,414,175 for whole milk marketed. The value of all poultry raised was \$26,030,584. The number and value of the chief kinds were chickens, 19,518,198, \$22,856,895; ducks, 1,545,943, \$2,275,603; turkeys, 166,721, \$683,524, and geese, 73,471, \$214,562. The chickens sold, 9,194,145 in number, were valued at \$10,606,501. Of 97,926,674 doz. chicken eggs produced, valued at \$37,031,301, 76,173,626 doz. with a value of \$28,789,424, were marketed. The wool clip, 2,940,972 lbs., was valued at \$1,076,493. Honey, amounting to 4,114,979 lbs. valued at \$753,555, was produced from 103,264 hives.

**Fisheries.** In 1930, New York ranked eighth among the states in the value of its commercial fisheries. The total amount of the year's take amounted to 48,849,000 lbs., valued at \$5,267,000. The state is unique in having five different fisheries—those of Lake Erie, Lake Ontario, the Hudson River, Long Island Sound and the Atlantic Ocean. It is one of two states having large fisheries in both salt and fresh water, the other being Florida. Among the more valuable marine species are oysters, squeteague, bluefish, flounders, scallops, clams, sea bass and cod. The Hudson River shad is almost extinct because of the pollution of the water. The several species taken from the lakes include lake herring, whitefish, lake trout and perch.

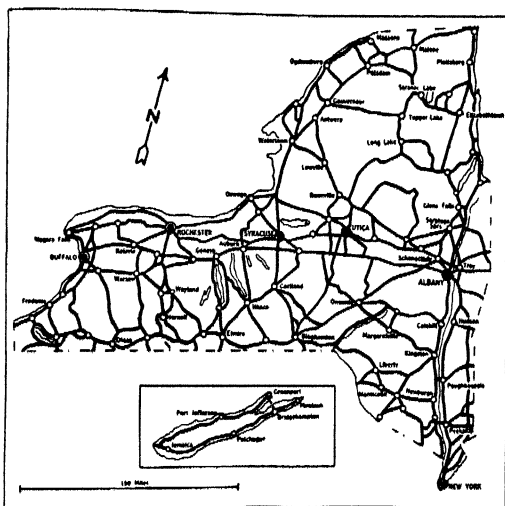
The inland streams and lakes, especially those of the Adirondacks, offer the finest sport, and these waters are kept well stocked by the State Conservation Commission. In 1930, 607,724 licenses were issued to sportsmen who paid \$661,891, these figures being respectively the largest for the country. In 1930 11

fish hatcheries were operated by 164 men at a total cost of \$287,713. The year's output included 10,540,725 trout, 548,800 bass, 93,263,835 other game fish and 932,572,230 commercial species. The U.S. Bureau of Fisheries cooperates in stocking New York waters, and in 1930 planted 580,000 whitefish, 27,850,000 cisco or lake herring, 120,000 landlocked salmon, 1,408,000 lake trout, 1,050,000 brook and other species of trout, 23,500 catfish, 50,000 bass and sunfish, 2,200,000 pike perch and 5,800,000 yellow perch.

**Transportation.** New York's waterways have always been an important factor in its commercial development. The Champlain Canal, completed in 1823, the Erie Canal, completed in 1825, the Oswego Canal, completed in 1828, and several other tributary canals formed a waterway system which soon established New York City as the prime connecting link with the middle west. Although the state improved this system, it gradually declined in importance until 1903. It was then noted that this decline was accompanied by a decrease in the export trade of the port of New York. This resulted in a new period of canal improvements, which were completed in 1918. A considerable increase in activity on the state barge canal system resulted. The port of New York, by far the leading center of the country's foreign trade, provides regular worldwide communication. Buffalo is the most important of the ports on the Great Lakes. The state's first railroad, the Mohawk and Hudson, was the second in operation in the United States. It was completed in 1831, when it was opened for service from Albany to Schenectady. In 1853 the Erie opened the first trunk line in the Union, while in 1869 the New York Central system started service along its water-level route from New York to Buffalo. Development from this point was rapid. In 1930 the total railway mileage was 8,331.

Many millions of dollars have been spent in the extension and improvement of the state's highway system. The port authority of New York has cooperated with the state of New Jersey in the construction of the Holland vehicular tunnel and several bridges to facilitate interstate transportation. In the metropolitan area, coordination of park recreational and highway facilities is being rapidly developed. Jones' Beach State Park on the south shore of Long Island, visited by thousands of residents of New York City weekly during the summer, is an outstanding example of this type of development. The work of the Westchester County Park Commission in this respect is also noteworthy. The suburban parks with adequate highway facilities recently developed by this organization include Kingsland Point Park, Croton Point Park, Tibbett's Brook Park, Glen Island Park, Playland, at Rye, and Willson's Woods. On Jan. 1, 1930, there were 118,496 mi. of highways, including 32,713 mi. of surfaced roads and 10,908 mi. of improved state highways. Highway expenditures during 1929 were \$107,023,618, the largest in any state. Motor

vehicle registrations in 1930 were 2,307,730 compared with 1,625,583 in 1925. The growth of transportation by truck is indicated by registrations, which increased from 278,918 in 1925 to 340,749 in 1930.



NEW YORK STATE ROADS

**Manufactures.** For more than 100 years New York has stood foremost in manufactures. The state achieved this rank very soon after the completion in 1825 of the Erie Canal connecting the Hudson River with Lake Erie. This important waterway rendered available a vastly increased supply of raw materials and gave access to the markets of the rapidly growing frontier. Later, railways, following closely the same low-level route, enormously expanded the facilities provided by water transportation. Along this great natural artery of commerce the major manufactures of the state have been developed. The factory centers situated on this route from the mouth of the Hudson to the outlet of Lake Erie produce more than five-sixths of the total manufactures of the state.

Besides its favorable geographic position and unsurpassed transportation connections with the populous interior, New York possesses the greatest seaport of the continent. This affords the immense advantage of water transportation for shipment of raw materials from and manufactured products to all countries reached by navigation. On the whole the state has attained its preeminence in manufactures through utilizing materials obtained mostly from beyond its borders in connection with the growth of New York City as a world metropolis of commerce, finance and industry.

According to the Census of 1930 New York with manufactures for 1929 valued at \$9,978,556,143 stood first among the states. Its 39,395 establishments gave employment to 225,391 officers and employees, who received \$644,503,633 in salaries, and to 1,105,966 wage earners, who were paid \$1,650,378,858 in wages.

These factories used a total of 3,986,781 horse power, expended \$209,306,626 for fuel and power, and \$4,795,329,359 for materials and supplies, and added by the process of manufacture \$4,973,920,158 to the value of their output.

In this highly diversified output, which comprised about one-seventh of the manufactures of the United States, there were 258 separately enumerated groups of products. Outstanding among these were women's clothing and printing and publishing; of the former the state produced about 75% and of the latter about 25% of the total output of the nation. New York ranked first in 30 and not lower than fifth in 70 of the products separately reported by the Census. Among the rankings for the state were first in men's clothing, fur goods, millinery, furniture, paper, perfumery, pianos and bread; second in boots and shoes, knit goods, cheese, cutlery, confectionery, hats, and motion pictures; third in flour, meat packing, silk and rayon and motor vehicles; fourth in electrical machinery, and hardware, and fifth in iron and steel, coke and machine tools.

The leading factory industries, with products amounting to upwards of \$100,000,000 each and comprising 58% of the total manufactures of the state, in order of value of output were:

Industry or Product	No. Persons Employed	Value of Products \$
Women's clothing	121,232	1,308,065,109
Printing and publishing, newspapers and periodicals		436,059,127
Men's clothing		397,393,904
Foundry and machine shop products		296,099,086
Bread and bakery products		295,199,411
Electrical machinery		280,139,078
Printing and publishing, book and job		274,041,493
Meat packing		247,425,951
Motor vehicles		232,345,843
Fur goods		228,489,135
Boots and shoes		189,775,703
Chemicals		168,728,982
Furniture		159,771,994
Knit goods		158,110,012
Brass and bronze		143,232,010
Iron and steel rolling mill products		139,352,239
Sugar refining (cane)		137,432,214
Motor vehicle bodies and parts		135,319,074
Paper		129,560,343
Millinery		125,957,160
Manufactured gas		112,876,140
Flour		108,765,016

Three-fourths of the state's manufactures were produced in two industrial areas: New York City, with environs in Westchester Co., and the Buffalo-Niagara Falls district, comprising Erie and Niagara counties, the former area contributing 63% and the latter 12% of the total output of the state. Manufacturing centers, with products valued above \$50,000,000 were New York City, \$5,987,817,097; Buffalo, \$720,903,181; Rochester, \$380,102,233; Syracuse, \$181,103,115; Schenectady (inclusive of Schenectady, Hamilton and Essex counties), \$178,732,536; Niagara Falls, \$131,207,257; Yonkers, \$113,513,455, and Utica, \$65,410,384.

**Commerce.** According to the census of 1930, there were in 1929 25,316 wholesaling establishments in

New York, with total sales of \$17,664,514,767. This volume represented 25.41% of the total for the United States and greatly exceeds the wholesale trade of every other state. The wholesalers gave full-time employment to 291,298 men and women, whose annual salaries aggregated \$697,121,695. New York City, the largest wholesale distributing center in the country reported sales in excess of \$15,000,000,000. Buffalo, Rochester, Syracuse, Albany, Binghamton, Yonkers and Utica were also important.

The total sales of the 189,921 retail stores amounted to \$7,239,632,514, the largest retail trade of any state in the Union. Sales per store, which averaged \$38,119 were exceeded only in four states. Sales per capita, which aggregated \$575.12, were surpassed only in California.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Food	71,878	\$1,878,868,293	25.95
Automotive	19,985	965,835,510	13.34
General Mdse.	9,776	939,957,283	12.98
Apparel	21,121	905,242,214	12.50
Lumber & Bldg.	9,122	425,295,608	5.87
Furn. & Household	5,863	410,120,321	5.67
All other stores	52,176	1,714,313,285	23.69
Total, all stores	189,921	\$7,239,632,514	100.00

Water-borne commerce handled in the Metropolitan area surrounding New York City, including a substantial volume handled by New Jersey harbors, included in the second district of New York, amounted to 234,354,441 tons with a value of about \$21,710,524,000.

**Finance and Banking.** The assessed value of all taxable property in New York in 1930 was \$28,602,349,548. The gross bonded debt was \$382,179,000, while the net funded debt, after deduction of all sinking funds, was \$275,972,368. Total revenue for the state in 1930 was \$272,586,976; total disbursements, \$256,397,986. The chief sources of revenue were corporation taxes, \$66,732,183, inheritance taxes, \$50,395,171, personal income taxes, \$40,246,521, stock transfer taxes, \$38,889,840, motor vehicle taxes, \$30,374,372 and motor fuel taxes, \$18,807,578. The principal expenditures were for education, \$98,221,250, highways, \$55,827,525, mental hygiene, \$28,137,232, correction, \$5,269,936 and conservation, \$6,516,578.

The Bank of New York was the first banking institution in the state, chartered in 1791. By 1812 there were 20 banks and 24 more were chartered by 1829. During this year a bill was passed which required all banks obtaining or renewing charters to contribute  $\frac{1}{2}$  of 1% of their capital annually to a common safety fund. By 1832, 52 banks were members of this fund and 12 did not belong to it. During the panic of 1837, the chartered banks were forced to suspend specie payments and their currency sold at a substantial discount. This caused agitation for a free banking law, which was passed in 1838. It provided for the investment of bank capital in New York state bonds and deposit of the bonds with

the state. This system proved effective in the depression of 1841, and again in the panic of 1857. As New York's banking system was the soundest in the Union at the time the national banking law was introduced, the innovation did not meet with immediate local favor. However, national banking was in the ascendancy from the Civil War until early in the twentieth century. Then the trend was reversed by the more liberal charter and tax provisions available to trust companies and state banks. Since 1851, every banking institution in the state has been examined annually by representatives of the state banking department. The superintendent of banks is appointed by the governor with the consent of the state Senate. Clearing houses originated in New York City, the financial center of the United States. The total volume of clearings in 1854, the first year, was \$5,633,000,000, compared with \$456,937,947,000 in 1929 and \$399,471,638,000 in 1930. The modern trend toward consolidation in banking circles resulted in a vast concentration of banking resources in New York City, which provided a financial bulwark during the depression of 1929. There were 1,140 banks in New York in 1930. Of these, 550 were national banks, 532 state banks and trust companies and 58 private banks. The aggregate capital of these institutions was \$951,353,800; their surplus and undivided profits, \$2,355,783,000. Total resources of all banks totaled \$23,297,812,000; with loans and discounts aggregating \$12,566,926,000. Total demand deposits were \$7,674,469,000; total time deposits, including postal savings, were \$7,869,547,000. Per capita demand and time deposits were \$1,226.64; per capita savings deposits were \$640.09. The total national bank circulation in 1930 was \$68,997,000.

**Government.** The legislative body of New York consists of a Senate composed of 51 members and an Assembly of 150 members, the former elected for terms of two years and the latter for terms of one year. They meet in annual sessions, unlimited in duration. The executive officers of the state are a governor, lieutenant governor, secretary of state, comptroller, treasurer, attorney-general, and a state engineer or surveyor, all chosen for terms of two years. The governor receives a salary of \$10,000. Judicial power is vested in a supreme court, a court of appeals, county courts and inferior courts. The supreme court consists of 7 judges elected for terms of 14 years with a salary per annum of \$14,200 for the chief justice and chancellor and \$13,700 for the other judges.

**Social Welfare Institutions.** There are three departments under which these institutions are divided: The Department of Mental Hygiene controls the schools and hospitals for feeble-minded and insane with the exception of the criminal insane; the Department of Correction controls the penal institutions; and the Department of Social Welfare takes care of every other state welfare institution, except that the camp for veterans at Bath is under the executive department of the state. The schools for

mental defectives are at Newark, Rome, Syracuse, and the Letchworth Village at Thiells. Craig Colony for epileptics is at Sonyea. Hospitals for the insane are at Binghamton, Brooklyn, Buffalo, Central Islip, Helmut, the Harlem Valley Hospital at Wingdale, Kings Park Hospital at Poughkeepsie, Manhattan Hospital in New York City, Middletown, Rochester, Utica, Ogdensburg, and Willard. A state training school is located at Albion, the state training school for girls is at Hudson, an agricultural and industrial school is at Industry, the state reformatory at Elmira and a reformatory for women at Bedford Hills. At Napanoch is a training school for defective delinquents. A hospital for incipient pulmonary tuberculosis is located at Raybrook, and the New York State Reconstruction Hospital is at West Haverstraw. A psychiatric hospital and institute is in New York City. The deaf are cared for in private institutions inspected by the Social Welfare Department and paid for by the state. The blind are similarly provided for. The institute for the blind at Batavia is administered by the Board of Education. Prisons are at Auburn, Dannemora, Comstock and Ossining. At Dannemora and Beacon are the hospitals for criminal insane. In 1929 laws were passed to place the training school for boys, formerly on Randalls Island, New York City, at Warwick. In 1930 laws were passed giving old age pensions, and in that year appropriations were made for a fifth institute for mental patients to be at Wassaic. At Oxford is the Women's Relief Corp Home, and at Iroquois the Thomas Indian School.

**Education.** The first school was established by the Dutch on the Island of Manhattan, in New Amsterdam, in 1638. This school is said to have been the first in America. Other Dutch villages opened similar schools, which were continued until the time of the Revolution. After the English occupation, a free grammar school was established in 1702, but it was discontinued seven years later. Trinity School in New York dates from 1710. In 1928 there were 12,101 public school buildings in the state, with 1,701,088 pupils in the public elementary schools and kindergartens, and 361,342 pupils in the public secondary schools. Children from 7 to 14 years of age are required to attend school the full term.

The number of persons from 5 to 20 years of age attending school in 1930 was 2,510,946, or 72.7% of the population within the ages specified, as compared with 1,856,260, or 64.9%, in 1920. The number of persons, 10 years and over, unable to read and write in 1930 was 388,883, or 3.7%, as compared with 425,022, or 5.1%, in 1920. Foreign-born white illiterates numbered 341,345, or 10.8% in 1930; and 389,603, or 14.2%, in 1920.

The institutions of higher learning maintained by the state include teachers' colleges at Albany and Buffalo; normal schools at Brockport, Cortland, Fredonia, Geneseo, New Paltz, Oneonta, Oswego, Plattsburg and Potsdam; the State College of Forestry at Syracuse; and schools and colleges of agriculture at

Ithaca, Canton, Alfred, Morrisville, Cobleskill, Delhi and Farmingdale, L. I. Prominent among the many other educational institutions are Columbia University, New York University, College of the City of New York, Hunter College, Cooper Union, Fordham University, General Theological Seminary and Union Theological Seminary, all located in New York City; Cornell University at Ithaca, Syracuse University, the University of Buffalo, Vassar College at Poughkeepsie, the University of Rochester, Rensselaer Polytechnic Institute at Troy, and the United States Military Academy at West Point. The Library Extension Division, State Department of Education, has its headquarters at Albany.

**Population.** In 1930 New York ranked first among the states with a population of 12,588,066 or an average of 264.2 per sq. mi., an increase of 2,202,839 or 21.2% over 1920. The population rose from 340,120 in 1790 to 3,097,394 in 1850, 7,268,894 in 1900, 9,113,614 in 1910, and 10,385,227 in 1920. In 1930 there were 12,150,293 or 96.5% whites, and 412,814 or 3.3% Negroes, an increase from 1920 of 19.4% whites and 108.0% Negroes. Of the whites, 8,958,744, including 3,351,491 of foreign and 1,133,307 of mixed parentage, were native-born, an increase of 1,572,829 from 1920; 3,191,549 were foreign-born, an increase of 405,437 since 1920. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 1,552,469 or 20.2% were Italian; 1,036,819 or 13.5%, Russian; 1,031,775 or 13.4%, German; 813,223 or 10.6%, Irish; 778,951 or 10.1%, Polish. The urban population was 10,521,952 or 83.6% of the total, an increase of 1,932,108 or 22.5% from 1920; the rural population was 2,066,114 or 16.4% of the total, an increase of 270,731 or 15.1% since 1920. In 1930 there were seven cities of 100,000 and upwards: New York, 6,930,446; Buffalo, 573,076; Rochester, 328,132; Syracuse, 209,326; Yonkers, 134,646; Albany, 127,412; Utica, 101,740.

**Occupations.** In 1930 5,523,337 persons, or 43.9% of the population, were gainful workers 10 years old or older; 74.4% of these were males and 25.6% were females; 62.5% were native white; 32.9% foreign-born white, and 4.3% Negro. Of the females 15 years old or older, 65.4% were single, 23.2% were married and 11.3% were widowed or divorced.

Among the principal occupations, with number of workers, were factory operatives and laborers, 774,344, including 94,906 persons in iron and steel industries and 67,997 persons in textile industries; clerks, 287,376 men and 167,673 women; salespersons, 224,457 men and 68,230 women; servants, 64,975 men and 210,482 women; farmers, 148,242, and farm wage workers, 104,178; retail dealers, 250,308; chauffeurs, 163,029; stenographers, 6,272 men and 133,250 women; bookkeepers and cashiers, 40,899 men and 81,726 women; carpenters, 113,641; school teachers, 17,277 men and 86,993 women; painters, glaziers and varnishers, 76,004; waiters, 43,971 men and 28,769 women; machinists, 71,342; building laborers, 70,508; tailors, 48,753, and tailoresses, 4,531; barbers and hairdressers,

34,885 men and 15,821 women; telephone operators, 45,392; manufacturing managers and officials, 44,595; manufacturers, 43,850; real estate agents, 43,518; electricians, 42,905; trained nurses, 42,783; mechanics, 42,119; manufacturing foremen and overseers, 41,543; and plumbers, 41,204.

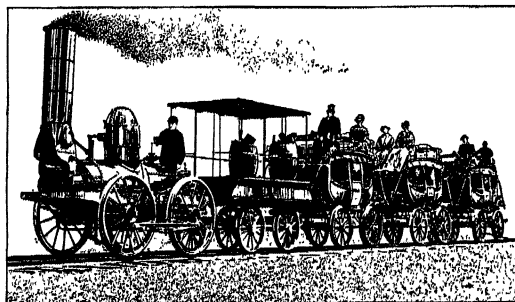
### HISTORY

The Italian VERRAZANO, in the service of France, discovered New York bay in 1524, and the Spanish navigator Esteban Gomez probably entered the harbor in 1525. French vessels occasionally ascended the Hudson to trade with the Indians. In July, 1609, CHAMPLAIN entered the state from the north, and in September HUDSON, an Englishman in the service of the Dutch East India Company, sailed into New York bay and ascended the Hudson to the limits of navigability. His reports, forwarded to Holland, stimulated further exploratory and trading enterprise. A group of houses at the southern extremity of Manhattan Island and another post on Castle Island, now part of Albany, built in 1615-1616, marked the beginning of Dutch occupation. In 1621 the West India Company was chartered and authorized to plant colonies and monopolize Dutch trade with the entire American coast. In June, 1623, New Netherland was formally created a province, and settlers shortly arrived from Holland with Cornelius Jacobsen Mey, first governor of the colony. Under the succeeding directors of the Dutch regime, William Verhulst, Peter Minuit, Wouter van Twiller, William Kieft and Peter Stuyvesant, agriculture was encouraged within limits (*see* PATROONS). But the life-blood of the colony was the fur trade, centering at the provincial capital, New Amsterdam, and at Ft. Nassau, now Albany, to which point the Iroquois brought the furs taken by western tribes.

Both Dutch and English had traded on the Connecticut River, but in 1650 commissioners of the NEW ENGLAND CONFEDERATION forced Stuyvesant to accept a demarcation which roughly determined the present boundary between New York and CONNECTICUT. Indian massacres at Staten Island, Pavonia, Hoboken and farther up the Hudson depleted the resources of the colony at a critical time. On Aug. 29, 1664, an English fleet under Col. Richard Nicolls entered New York bay, and after a few days of negotiation the colony was surrendered. New Netherland was now New York, a British colony, with James, Duke of York, as its proprietor. Friendly relations with the Iroquois, so essential to the fur trade, were sought and won by the English. The transition from Dutch to English institutions was in general effected gradually and without detriment to the rights of the Dutch settlers. Governors Nicolls and Francis Lovelace, 1668-73, maintained an autocratic provincial government, but gave freeholders a voice in the government of the towns. For a year the Dutch were again in possession of New York; but the Dutch title was extinguished by treaty in 1674, and Gov. Edmund Andros began a turbulent tenure. In 1686

a Charter of Liberties and Privileges was granted New York City while Thomas Dongan was governor, 1683-88, but was vetoed by James II. New York was part of the consolidated Dominion of New England, including the New England colonies and New Jersey, under the authority of Andros in 1688. Confusion, echoing the Revolution of 1689 in England, led to an extra-legal government in New York City under a German merchant, Jacob Leisler, who was executed for treason in 1691. The history of New York throughout the remainder of the colonial era was characterized by conflicts between the governor and the assembly over issues of popular government; the defence of the northern frontier against the French, and correlative attempts to extend the fur trade; the growth of the towns; official encouragement to the Episcopal church; and, after 1763, the development of an alliance with the other seaboard colonies in the face of a common evil, the new British commercial policy. The proportion of Loyalists and moderates in New York was probably greater than in any other northern colony; but two cargoes of tea were rejected in 1774, and on July 9, 1776, a newly-elected convention approved the DECLARATION OF INDEPENDENCE. Possession of the Hudson Valley and New York City were essential elements of British strategy in the REVOLUTIONARY WAR; New York was, accordingly, the field of extensive operations of the British army and navy, and its frontier sections were ravaged by Indians.

New York ratified the ARTICLES OF CONFEDERATION in 1778, and was the first of the states owning western lands to surrender its claims to the Confederation. Of its three delegates at Philadelphia in 1787, Robert Yates and John Lansing, Jr., withdrew, and only ALEXANDER HAMILTON signed the Constitution. Over the fight for ratification, led by Hamilton and ROBERT R. LIVINGSTON against George Clinton and others, developed lines of political cleavage which were manifest until the Civil War (*see* CLINTONIA;

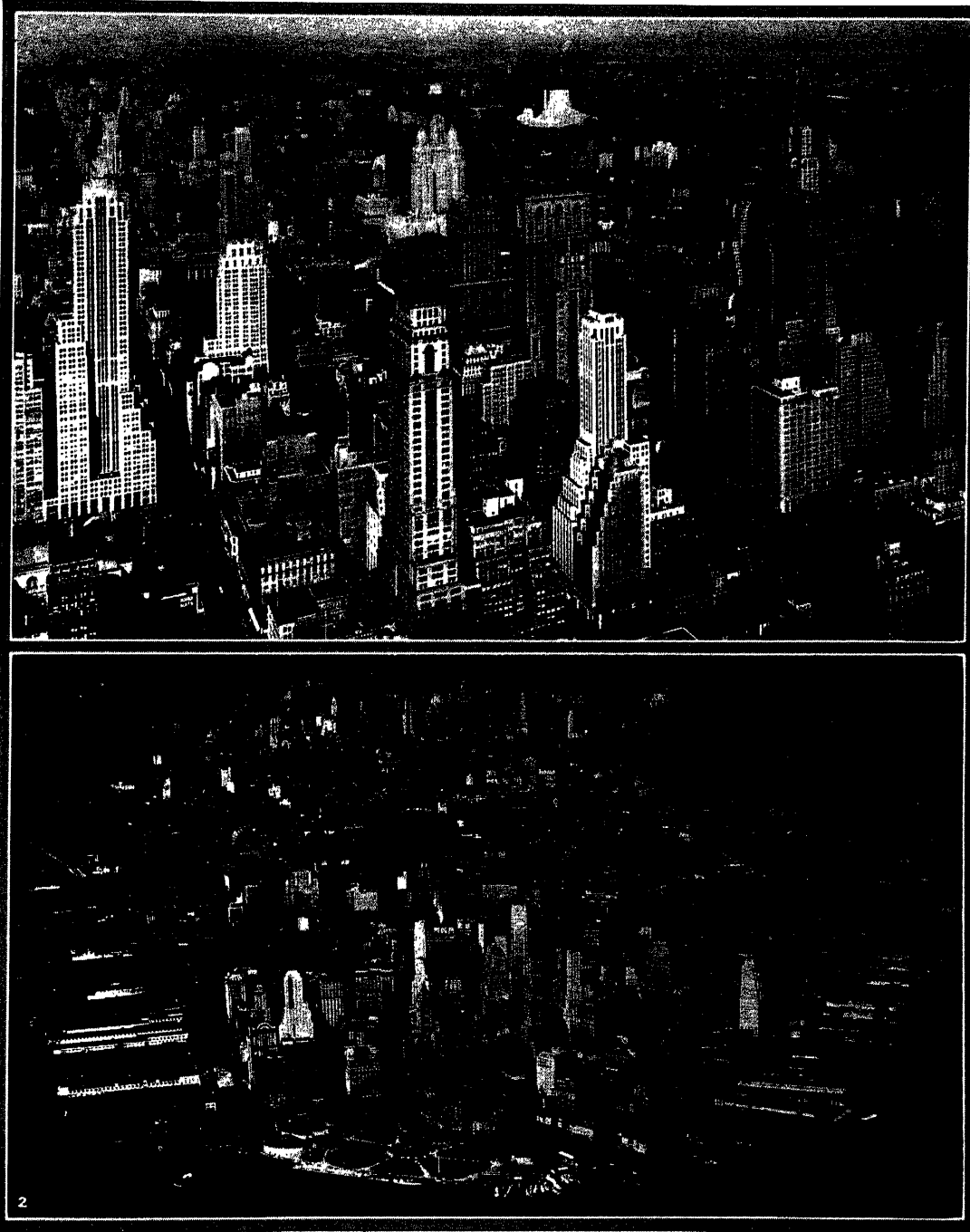


THE DE WITT CLINTON ENGINE

*The Clinton made its first trip in 1831 between Schenectady and Albany—the first engine to carry a train in the State of New York*

QUIDS; HUNKERS; LOCOFOCOS; ALBANY REGENCY). The five minor political parties of importance in New York history between 1830 and 1860, the ANTI-MASONIC, ANTI-RENT, LIBERTY, FREE SOIL, and "KNOW-NOTHING" groups, were diverse in many respects, but

## NEW YORK, N. Y.



1, PHOTO FROM EWING GALLOWAY; 2, C. F. DOHERTY PHOTO, FROM EWING GALLOWAY

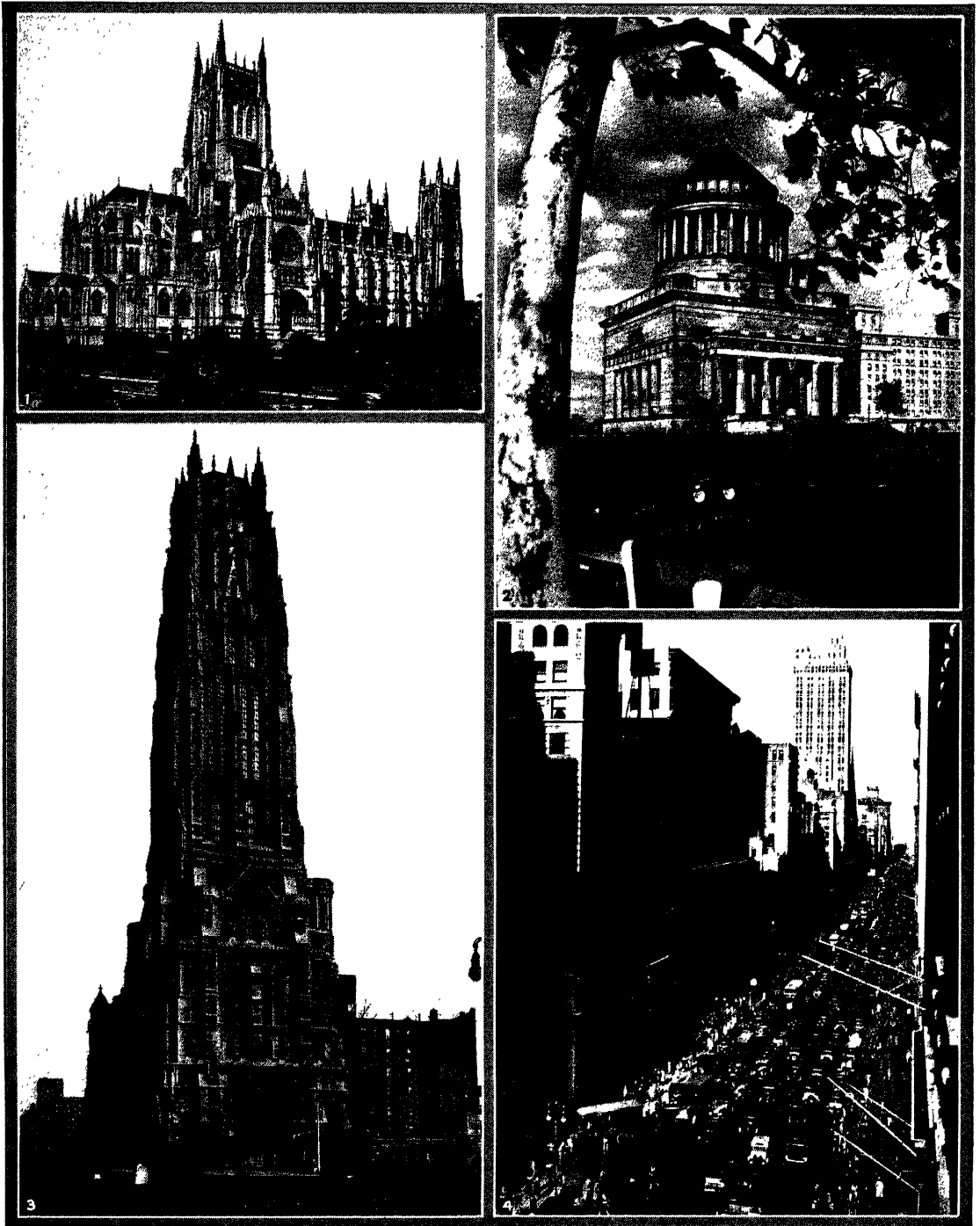
### NEW YORK—CITY OF SKYSCRAPERS

1. Midtown section. At the extreme left, at the northwest corner of Fifth Avenue and 42nd Street, is 500 Fifth Avenue (56 stories). At the extreme right is the Chanin Tower with the Chrysler Building's 1,050-ft. pinnacle for a background. The twin-towered building in the upper center

is the 50-story Waldorf-Astoria Hotel. The large white building in the far distance is the Cornell Medical Center. 2. Aerial view of the city showing from the Battery to Central Park and from the Hudson to the East River.



## NEW YORK, N. Y.



PHOTOS FROM. 1. WILLIAM FRANGE; 2, 4. R. I. NESMITH AND ASSOCIATES; 3. PUBLISHERS PHOTO SERVICE

### OUTSTANDING POINTS OF INTEREST IN NEW YORK CITY

1. Cathedral of St. John the Divine, one of the greatest Gothic churches in existence. 2. Tomb of Ulysses S. Grant on Riverside Drive. 3. The Riverside Church, opened in

1930. Chartres Cathedral, France, particularly influenced the design of the church, in French Gothic style. 4. Fifth Avenue, looking north from Forty-third Street.

alike in the burning zealotness of their protest against an infringement on individual liberty. Such misdirected zealotness reached a state of hysteria in the DRAFT RIOTS during the Civil War. From 1862 to 1864 the Democratic party controlled the State. Yet New York furnished 448,850 men to the Union armies. The Democratic triumph in the state elections of 1868 was largely due to the chicanery of the TWEED RING, the ultimate exposure of which implicated two Supreme Court judges, among other state officials. The Republican party in the state was demoralized for several years by the quarrel between the Stalwarts and the Half-Breeds, in great part a struggle to control the patronage. The dramatic climax was the resignation of both United States Senators from New York, Conkling and Thomas C. Platt, in 1881. In 1894 the Republicans regained control in the state, but the reform administration of Gov. Hughes resulted in splitting the party, and in 1910 a Democrat was elected governor. Political control has since wavered between the two parties, with the Democrats in control of New York City and the Republicans entrenched in a majority of the upstate counties. Despite the importance of "personalism" in state politics and the factor of TAMMANY HALL in New York City, leaders of New York politics have generally occupied an important position in national affairs; Hamilton, AARON BURR, De Witt Clinton, JOHN JAY, MARTIN VAN BUREN, Thurlow Weed, WILLIAM H. SEWARD, SAMUEL J. TILDEN, GROVER CLEVELAND, THEODORE ROOSEVELT, CHARLES EVANS HUGHES and others may be mentioned. In 1932 the state gave its 47 electoral votes to Franklin D. Roosevelt and elected Herbert H. Lehman, Democrat, governor. Robert F. Wagner, also a Democrat, was reelected to the Senate.

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**NEW YORK**, the largest city of North and South America, and the financial and commercial capital of the United States, is located in the southeastern corner of New York state, where the Hudson River empties into New York Bay. The metropolis exceeds all cities of the world in density of population, in foreign commerce entering its generous harbor, in merchandise manufactured and sold, and in concentration of wealth. On Apr. 1, 1930, the Bureau of the Census gave the population of the incorporated city as 6,930,446 persons, living in an area of 308.95 sq. mi. Its extreme length is 36 mi. and its maximum width 16½ mi., the distance from the Hudson River shore at 23rd Street to the eastern county line of Queensborough. The common term, "Metropolitan District," is used to denote the industrial and commercial areas adjacent to New York, and includes Jersey City, Newark, Paterson, Hoboken and Union City in New Jersey; Yonkers, Mount Vernon, New Rochelle and White Plains in New York state; and Stamford and Norwalk in Connecticut. (See separate articles on these cities and towns.) This district had an esti-

mated population in 1930 of 9,472,500, a figure considerably in excess of Greater London. New York records an average temperature of 31° F. in January, and of 74° F. in July. The average annual precipitation is 43 in.

New York City's rise to world prominence can best be explained by a number of geographic factors. First, New York Harbor is both large and deep, thus favoring the growth of a great seaport. Second, except for Boston, New York is the nearest port to Europe, the continent with which the United States carries on the most trade. Third, the Hudson River Valley extending northward from New York City joins the Mohawk River Valley near Albany. This lowland, called the Hudson-Mohawk Valley, joins the Lake Plain to the west and then leads westward to the Central Plain; thus there is a lowland route for railroads all the way from New York to the Central Plains. There is no other route that rises so slightly above sea level from the Central Plains through the Appalachian Highlands to the Atlantic Coast, and since New York stands at the Atlantic end of this great natural highway, it has become the greatest ocean gateway for the Atlantic Coast. And since the United States carries on more trade with Europe than with any other part of the world, New York has become the greatest of all our seaports. In addition, New York is a gateway for newcomers, in other words, labor, which aids manufacturing. And fifth, New York is a great market and has excellent ocean and rail transportation, abundance of power from coal easily obtained and plenty of labor. These factors promote manufacturing.

**Geographic Setting.** The divisions of New York are defined by generally natural lines, which make the five boroughs distinct geographical entities. Each borough embraces a state county. New York Co. consists of Manhattan, an elongated island between the Hudson and the East rivers, with an area of 22.20 sq. mi., and a population in 1930 of 1,867,312 (see MANHATTAN ISLAND); the Bronx, or Bronx Co., consists of the area of 42.74 sq. mi. northeast of Manhattan across the Harlem River, with a population in 1930 of 1,265,258; the borough of Brooklyn, or Kings Co., consists of 74.14 sq. mi. at the western tip of Long Island, with a population in 1930 of 2,560,401; the borough and county of Queens consists of LONG ISLAND CITY and adjacent territory on Long Island, northeast of Kings Co., 109.88 sq. mi. in area, with a 1930 population of 1,079,129; Richmond, or Richmond Co., consists of the 59.99 sq. mi. of STATEN ISLAND, southwest of Brooklyn and Manhattan, with a population in 1930 of 158,346. The Jewish population in 1927 was approximately 1,765,000, giving New York the greatest Jewish population of any city. In 1930 the total Negro population was 327,706; HARLEM, the distinctive Negro quarter, with a population of over 200,000, is the largest Negro city in the world. The balance of the alien population is made up of Italians, central and northern Europeans, Balkan emigrants, Russians, Irish, Chinese and

the other nations inevitably present in a metropolitan "melting pot." In 1750 the population was approximately 10,000 of which 2,000 were slaves; in 1860 the population was 1,174,779; in 1890, 2,507,414; and in 1920, 5,620,048.

The disposition of the waterways makes the chief lines of metropolitan division. The HUDSON RIVER divides Manhattan and the west side of the Bronx from New Jersey; the EAST RIVER, or properly the narrow western end of Long Island Sound, separates Brooklyn and Queens from Manhattan and the southern line of the Bronx; the Harlem River and the HARLEM SHIP CANAL flowing east and south from the Hudson, at Spuyten Duyvil to the East River, is the line of demarcation between Manhattan and the Bronx; the Narrows, between Upper and Lower New York Bay, divide Richmond, or Staten Island, from the Brooklyn shore. Lesser waterways within the city are Newtown Creek, emptying into the East River; Jamaica Bay; the Bronx River, flowing through that borough and emptying into the East River; and Wallabout Creek, at the head of the United States Navy Yard in Brooklyn. The waters are dotted with islands. Governor's Island is situated in the Upper Bay off the tip of Manhattan and is used as a United States Army post; Bedloe's Island directly west serves as a site for Bartholdi's STATUE OF LIBERTY; ELLIS ISLAND, between the New Jersey and Brooklyn shores, is used as an immigration station by the United States Department of Labor; in the East River Welfare, Randalls and Wards islands and City Island serve as the sites of municipal institutions; Jamaica Bay is studded with islets, among them Barren Island, site of the Floyd Bennett Airport, dedicated in 1931. the total New York City shore line, including pier frontage, is 994.8 mi.; the Port of New York Authority, however, has jurisdiction over 1,500 sq. mi., an area extending from SANDY HOOK, a peninsula on the New Jersey Shore, to Tarrytown, on the Hudson.

**Streets.** Downtown New York, the region at the foot of Manhattan, was the original Dutch colony, and even after two centuries many of the streets in this section are narrow and winding. Skyscraper construction has made veritable canyons of some of them, notably WALL STREET, running from lower Broadway east to the East River. But 19th-century New York developed northward and eastward with benefit of surveyors. Consequently the layout of most of Manhattan is orderly. Cross-town streets are numbered, as are most of the thoroughfares cutting the island lengthwise. The outstanding exception is Broadway, originally a lane leading from the colonial settlement up to the farms in the north of the island. The present-day Broadway, one of the most celebrated thoroughfares of the world, runs from BOWLING GREEN, near the southern tip of Manhattan, north to 14th Street, and thence in a northwesterly direction to 242nd Street, where it becomes the Albany Post Road. In its downtown reaches the street passes through the financial district; from 40th to 59th Street it is a lavishly illuminated artery given over to thea-

ters, night clubs, hotels, restaurants and automobile salesrooms. In its path it touches the downtown City Hall Park, Union Square, extending from 14th to 17th Street, Madison Square, extending from 23rd to 26th Street, and it skirts by Central Park at 59th Street. Fifth Avenue, the dividing line of the cross-town streets, begins at Washington Square and continues north to the northern end of the island. It is lined with expensive shops, clubs and fine residences, and from 59th to 110th Street forms the eastern border of Central Park. RIVERSIDE DRIVE is a residential thoroughfare flanking the Hudson, beginning at 72nd Street. Park Avenue, from 32nd Street north to Harlem, has supplanted Fifth Avenue as the aristocratic thoroughfare, and is bordered by elaborate apartment dwellings. THE BOWERY, a street dating from Dutch times in New York, runs from Chatham Square, near Chinatown in downtown New York, to COOPER UNION, and was once notorious for its saloons, cheap resorts and its picturesque vulgarity. The principal cross-town thoroughfares are 14th, 23rd, 34th, 42nd, 59th, 110th and 125th Streets, the last bisecting Harlem.

The orderly arrangement of most of the Manhattan streets and avenues is conspicuously lacking in Brooklyn, where the absorption of villages and towns, each with an independent street plan, has resulted in a labyrinth confusing to visitors and residents alike. Ocean Parkway and Flatbush Avenue are noteworthy thoroughfares. The street plans of the Bronx, of the Richmond communities on Staten Island, and of Queens are comparatively modern.

**Transportation.** While comparisons are not altogether valid in communication facilities, it may fairly be said that no city in the world equals New York in means of transportation. The city is a terminus for the railroad systems of the New York Central, Pennsylvania, New York, New Haven & Hartford, Baltimore & Ohio, and numerous other lines, either entering Manhattan by the Grand Central Terminal at 42nd Street and Park Avenue, or by the Pennsylvania Station at 32nd Street and Seventh Avenue. In 1930 the Port Authority authorized the construction of Manhattan's first union inland freight station, to occupy a large block on the lower west side. A maze of other facilities supply transportation within the city. The Interborough Rapid Transit Company operates four elevated lines in Manhattan and two subway lines serving all the boroughs except Richmond. In Manhattan the four-track Interborough lines run the length of the island on the east and west sides, with a cross-town "shuttle" at 42nd Street. The Brooklyn-Manhattan Transit Corporation operates a line in Manhattan from downtown New York north beneath Broadway to 42nd Street, thence to 59th Street beneath 7th Avenue. In 1931 the city Board of Transportation completed a subway from Brooklyn to Manhattan, up 8th Avenue to Central Park West and thence to 215th Street. Municipal subways were also planned to run the length of Second and Sixth Avenues in Manhattan. In addition to

the subway tubes underlying the East River between Brooklyn and Manhattan, the Hudson River tubes provide rapid transportation from Manhattan to Jersey City and Hoboken. Other submarine crossings beneath the Hudson are the Holland Vehicular and the Pennsylvania tunnels, and tubes for passenger and freight traffic burrow beneath the Harlem and East rivers. In 1931 the Port Authority was preparing plans for a second vehicular tunnel under the Hudson, and for a similar project under the Narrows to connect Bay Ridge, Brooklyn, with Staten Island. In addition to the elevated lines, street cars, buses and taxicabs provide surface transportation. Above water Manhattan, Brooklyn, and Queens are connected by the following suspension bridges—Brooklyn, total length, 6,016 ft., Williamsburg, 7,308 ft., QUEENSBORO, 7,449 ft., Manhattan, 6,855 ft., and HELL GATE, 18,000 ft. Thirteen bridges cross the Harlem River. The Hudson River Bridge connecting Manhattan at Broadway and 178th Street with Fort Lee, N.J., was completed in 1931 and named the GEORGE WASHINGTON BRIDGE; its span of 3,500 ft. was then the longest in the world. In the same year the Tri-Borough Bridge, 13,560 ft., was under construction, roughly parallel to the Hell Gate span, designed to connect Queens, Manhattan and The Bronx. Other bridges include the KILL VAN KULL, 8,100 ft., connecting Port Richmond, Staten Island, with Bayonne, N.J., also completed in 1931, the longest steel arch bridge in the world; the Goethal's Bridge, connecting Howland Hook, Staten Island, with Elizabeth, N.J.; and Outerbridge, over Arthur Kills between Tottenville, Staten Island, and Perth Amboy, N.J. Inter-borough water transportation is provided by ferries; a fleet of small steamers connect the city with Sandy Hook, CONEY ISLAND, Rockaway Beach and other adjacent resorts on the Atlantic, Long Island Sound or up the Hudson. The city is connected with the national network of airways by way of near-by airports, chief among them Curtis Field and Roosevelt Field on Long Island, the municipal field on Barren Island, the Newark, N.J., Airport and the Teterboro Airport at Hasbrouck Heights, N.J.

**Buildings.** The skyscrapers are the most spectacular aspect of New York. The era of tall buildings began in 1891, with the development of the steel frame skeleton. In 1907 the Singer Building lifted its tower 612 ft. in the downtown financial district as an answer to the problems presented by restricted building areas and high property taxes. The Singer structure was soon exceeded in height by the Metropolitan Tower at Madison Square, the first tall building to appear north of the Wall Street section. In 1912 lower Broadway was adorned with Cass Gilbert's WOOLWORTH BUILDING of 51 stories, 792 ft. high. This remained man's tallest structure, save the Eiffel Tower, until the skyscrapers appeared in the midtown or 42nd Street area. In 1930 the CHRYSLER BUILDING, 1,046 ft. was completed, but it was exceeded in height the next year by the EMPIRE STATE BUILDING, 1,248 ft., topped with a mooring mast for

dirigibles. The latter building was built on the site of the demolished Waldorf-Astoria Hotel, at 34th Street and Fifth Avenue, and was heralded as the first of a third skyscraper development to arise between the financial district and the midtown buildings. The increasing height of office buildings made possible by the "setback" architecture, which meets the building code restrictions, was reflected in apartment buildings; in the latter case the utilitarian "setback" has provided apartment dwellers with terraces or "skyscraper gardens." In 1931 construction was begun on a series of unit skyscrapers to comprise Radio City, between Fifth and Sixth Avenues, from 48th to 51st Streets; the project was planned to house the Metropolitan Opera Co., a motion picture theater and the offices of theatrical enterprises and broadcasting companies. Noteworthy buildings in a more conventional mould include the massive Custom House, at Bowling Green, Trinity Church, facing Wall Street, the Stock Exchange, the City Hall, dating from the early 19th century, at City Hall Park, the New York State Appellate Court on Madison Square, the classic Morgan Library on 36th Street, the Public Library at 42nd Street and Fifth Avenue, Grand Central and Pennsylvania stations, St. Patrick's Cathedral, the Metropolitan Museum at Fifth Avenue and 82nd Street and the massive Cathedral of St. John the Divine on Amsterdam Avenue between 110th and 113th Streets.

**Museums, Parks, Monuments.** New York is rich in museums covering virtually the entire field of human knowledge. The most celebrated are the METROPOLITAN MUSEUM, AMERICAN MUSEUM OF NATURAL HISTORY, Museum of the City of New York, opened in 1932, and the Brooklyn Institute of Arts and Sciences. The chief recreational grounds are CENTRAL PARK, 840 acres, Van Cortlandt Park, 1,132 acres, Riverside Park, 154 acres, Morningside Park, 31 acres, Prospect Park, Brooklyn, 526 acres, Highland Park, Queens, 49 acres, and La Tourette Park, Richmond, 580 acres. Special parks include the NEW YORK ZOOLOGICAL GARDENS (Bronx Zoo), Brooklyn Zoo, and the New York and Brooklyn Botanical Gardens.

Several of New York's monuments are of heroic proportions. Foremost is the STATUE OF LIBERTY in the Upper Bay, and perhaps the second in interest is GRANT'S TOMB on Riverside Drive. The Obelisk is in Central Park, the Soldiers' and Sailors' Monument on Riverside Drive, the WASHINGTON ARCH in Washington Square at the foot of Fifth Avenue, and a statue of Columbus stands on a tall column in Columbus Circle. The chief monument in Brooklyn is the Soldiers' and Sailors' Memorial Arch at the entrance to Prospect Park. Manhattan is dotted with statues of Washington, Franklin, Webster, Greeley, Hamilton, Shakespeare and other noted persons. In 1931 the HALL OF FAME on University Heights had placed 53 busts of representative Americans.

**Industries.** For the year ending Dec. 31, 1930, the value of imports to the Port of New York was

\$1,882,187,459, and exports were valued at \$1,699,794,188. On the basis of these totals New York claimed to be the first shipping port in the world. The total assessed value of the city was placed at \$19,790,795,242, the tax basis of that year. In 1929 the United States Bureau of the Census placed the approximate value of New York City manufactures at \$5,980,000,000, the retail trade amounted approximately to \$4,402,880,000; and the wholesale trade proper, to \$7,941,876,890. The leading manufactured products in the same year were, in order of value, women's clothing, men's clothing, printed and published material (newspaper and periodical), furs, millinery and lace goods, bread and bakery products, meat products, printed and published material (book and job), tobacco, cigars and cigarettes, and boots and shoes. New York leads all other American municipalities in variety of manufactures.

**Government.** The incorporated City of New York is governed by an elected mayor, five borough presidents, and a board of aldermen numbering 65 members and its president. The Board of Estimate and Apportionment, the executive and financial body, is composed of the mayor, comptroller, president of the board of aldermen, and the borough presidents. In 1931 the municipal budget was \$620,840,183.37, approximately \$103 for every man, woman and child in the city.

**History.** Historians generally agree that the correct date of the founding of New York is May, 1626, when Peter Minuit, the Dutch director-general, purchased Manhattan from the Indians for beads and trinkets worth about \$24. The island was named New Amsterdam. White traders had visited the site as early as 1614, and in 1609 Hendrik Hudson sailed up New York Bay. In 1644 the English took possession of Fort Amsterdam and renamed the island

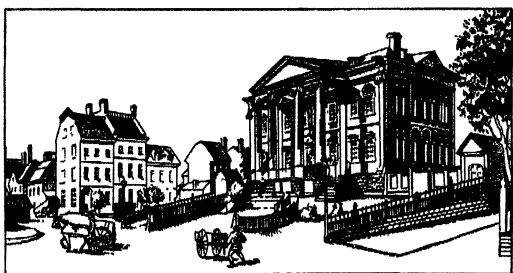
City and the towns of Flushing, Newtown and Jamaica, were incorporated into Greater New York, which was then divided into the present five boroughs.

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**NEW YORK, COLLEGE OF THE CITY OF,** a municipal institution for men and women, founded in 1847 at New York City. It was established by the Board of Education of New York City to add a collegiate institution to the public school system, and was first called the Free Academy. Degree-granting powers were conferred in 1853, and subsequently the institution became known as the College of the City of New York. Supported by New York City, it is open only to residents, to whom admission and instruction are free. The college comprises a preparatory department, the College of Arts and Science, Graduate School, schools of Commerce, Education and Engineering, a summer school and extension courses. The main group of buildings is located in Washington Heights. The appropriation in 1931 by the City of New York was \$2,847,510. Outstanding in the library of 110,000 volumes are the Simon Newcomb Library for Physics, the Simon Newcomb Library for Mathematics, and the Wolcott Gibbs Library for Chemistry. In 1931-32 there were approximately 26,400 students and a faculty of 618, headed by Pres. **FREDERICK B. ROBINSON.**

**NEW YORK, UNIVERSITY OF THE STATE OF,** an institution in which is vested the department of education of the State of New York. The university is located at Albany and is not a teaching institution. Its province is the entire range of public education in the state, including all public schools, academies, colleges, professional and technical schools, universities, libraries and museums. The University of the State of New York grants all educational charters in the state and apportions state education funds. It had its origin in a corporation, created by act of the State legislature in May 1784, which was designated as "The Regents of the University of the State of New York." Given the power to found and endow schools and colleges throughout the state, the corporation was similar to a state department of education, and yet it included all the chartered teaching institutions of academy and collegiate rank. The corporation was reorganized in 1787, but the system in general remained the same. In this form it continued to operate with few radical changes for more than 100 years. In 1895 the Regents became a constitutional body under the title, "The University of the State of New York." During its existence, the corporation of the Regents had exercised very little control over the common schools, so that two state educational systems, one in control of academic and higher education and the other in control of common schools resulted. In 1904 the two systems were united under the Board of Regents. In 1931, the university was headed by **FRANK P. GRAVES**, Commissioner of Education.

**NEW YORK STATE BARGE CANAL SYSTEM,** an artificial waterway from Buffalo to Albany,



AFTER LITHOGRAPH BY C. CURRIER

**THE GOVERNMENT HOUSE, NEW YORK, BUILT IN 1790**  
 "At the foot of Broad Way, facing the Bowling Green. This house was first intended as the residence of Washington. He never occupied it, as the capitol was moved. It later became the home of Gov. George Clinton and of Gov. John Jay and subsequently, from 1799 to 1815, the custom house."

New York. The colonists in 1774 revolted against the British governor, and two years later New York became Washington's military headquarters. The same year the British captured the island and held it until the surrender of Cornwallis in 1781. In 1863 it was the scene of the Draft Riots. In 1898 Kings and Richmond counties, together with Long Island

connecting Lake Erie with the Hudson River and including four older canals—the old Erie, the Champlain, the Oswego and the Cayuga and Seneca. The project necessitated 440 mi. of new construction and the canalization of 350 mi. of lakes and rivers. The result is a waterway 970 mi. long with a main channel at least 12 ft. deep and 75 ft. wide at the bottom, while in lakes and rivers the width is at least 200 ft. Forty-six per cent of the state is within 20 mi. of the canal and 71 per cent within 50 mi.

Its history really begins in 1891 with the agitation to deepen the old Erie Canal. In 1903 a bond issue of \$101,000,000 was voted and work began on a canal intended to carry barges 150 ft. long with 10 ft. draft. Since shipping by the canal cost approximately only 26 cents per ton from Buffalo to New York City as against about \$2 per ton by railroad, it was hoped that there would be an enormous traffic with resultant savings to shippers and the public. Unfortunately the canal has not been used to anywhere near its capacity of 10,000,000 tons a year—a capacity that can be enlarged to 20,000,000 tons.

In constructing the new canal it was necessary to build 25 locks on the Erie section, 11 on the Champlain canal, 7 on the Oswego branch and 4 on the Cayuga and Seneca canal. The standard lock is of concrete with a concrete floor except where natural rock can be utilized. The lock lifts are from 6 ft. to 40½ ft. in lock No. 17 at Little Falls. It was also necessary to build a large number of spillways and several dams. The crescent dam is 1,922 ft. long and the dam at Vischer's Ferry 2,000 ft. Freight terminals have been built at several cities along the route and loading platforms and harbors at other points. There is a large New York City terminal.

Barges of 2,000 tons displacement used singly will pass through any of the locks, or two 1,500 ton boats can be locked through together. Such barges pass easily even at points of minimum width. Almost without exception the barges carry their own power and horse or mule drawn barges are a thing of the past. See *ERIE CANAL*.

**NEW YORK UNIVERSITY**, New York, N.Y., a coeducational institution chartered by the New York state legislature in 1831. The university has colleges in arts and pure science, commerce, dentistry, education, medicine, engineering, fine arts, business administration, and law, a graduate school and a school of retailing. Research is conducted in aeronautics, medicine, engineering and business. The university is divided into the Washington Square and University Heights branches. The American Hall of Fame (see *HALL OF FAME, AMERICAN*) is located on the University Heights campus. In 1931 the university had an endowment of \$6,872,894. The total enrollment in the degree-conferring colleges and schools in 1931 was 31,757, of whom approximately 19,000 were following standard full-time curricula. The instruction staff, headed by Chancellor ELMER E. BROWN, numbered 1,735.

**NEW ZEALAND**, a British dominion consisting of two large islands, called North Island and South Island, to which are attached politically a number of small islands and islets lying at some distance from the main group. The parallels of 34° and 48° S. lat. enclose the main islands, which lie in the South Pacific Ocean about 1,200 mi. southeast of Australia and 5,400 mi. from San Francisco. South Island has an extreme breadth of 180 mi., and North Island, 280 mi.; the total length of both is 1,040 mi. The other islands and islets lie between the meridians of 166° and 170° E. long.

Islands	Area	Pop. 1926
North Island and Islets.....	44,131	831,813
South Island and Islets.....	58,120	511,942
Stewart Island and Islets....	662	446
Chatham Islands .....	372	268
Auckland Islands .....	225	
Campbell Islands .....	44	
Antipodes Islands .....	13	Uninhabited
Bounty Islands .....		
Snares Islands .....		
Kermadec Islands .....		
Cook Islands .....	150	
Other Islands .....	130 }	13,887
Tokelau Islands .....	4	1,033
Western Samoa (Mandatory) ..	1,050	40,299
Maori Population .....		63,670
Total .....		1,463,278

On April 1, 1931, the population of New Zealand, its dependencies and mandated territory had increased to 1,572,509.

New Zealand is divided into nine provincial districts: Auckland, Hawke's Bay, Taranaki and Wellington in North Island, and Canterbury, Marlborough, Nelson, Otago and Westland in South Island. Wellington, the capital, and Auckland, the largest city, are in North Island.

**Surface Features.** A large portion of the surface of New Zealand is mountainous. There are no great areas of level country, but elongated plains occur. The mountains of North Island run from Cook Strait northeast to East Cape, and include several active and dormant volcanoes. Mt. Cook, 12,349 ft. high, in South Island is the highest peak of the Southern Alps. The ranges of North Island are continued across Cook Strait and have their culminating point in Mt. Cook, which has large glaciers on its flanks. There are several hot springs and geysers on the islands. Many lakes occur, some of great beauty; Taupo, with an area of 238 sq. mi., Wakatipu, 112 sq. mi., and Te Anau, 130 sq. mi., are the largest. The rivers are too short and rapid to be of any real use for navigation; but the Clutha, 260 mi. long and discharging over 2,000,000 cu. ft. of water per minute into the sea, although bar-bound, has great potentialities as a source of electric power.

**Climate.** Chiefly owing to the fact that New Zealand extends through 13 degrees latitude, the climate varies considerably. In general it is mild and healthy with an abundant rainfall. The tempering

winds blowing from the ocean keep the sub-tropical North Island free from high temperatures and bring a large amount of rain in winter, when the path of the "roaring forties" or constant westerlies moves north with the sun.

**Fauna and Flora.** New Zealand has no animals of its own, with the exception of two species of bats. The Maori rat and wild pig were introduced. The wingless moa is now extinct, and there are no snakes or harmful insects, except the katipo spider. Over 200 species of birds—resident and land birds, seabirds and migrants—exist on the islands. The wingless and tailless kiwi (*apteryx*), with feathers like hair, attracts much attention.

Many species of ferns but few brilliant flowers occur in the dominion. The native flax plant (*Phormium tenax*) is of economic value for the preparation of binder twines and ropes; the cultivation of this plant has been introduced into the United States and Ireland. Valuable timber is furnished by the kauri or damar pine, but the supply has diminished. From the kauri is exuded a clear gummy fluid which hardens as it dries and drops off the tree into the soil. The gum is exported for the manufacture of varnishes and linoleum.

**Agriculture.** The land policy of New Zealand, hostile to the formation of large estates, has caused the dominion to become a country of small and medium-sized farms. Of 66,390,000 acres of land in the two islands, more than 2,000,000 acres are used for agriculture, about 6,500,000 for dairying and almost 40,000,000 for pastoral farming. The field crops are wheat, oats, barley, maize, beans and peas. Most of the farms have orchards, and in North Island fruit-raising is a commercial enterprise. In 1926, 700,000 cases of apples and pears were exported under a government guarantee. Peaches, apricots, plums and lemons are also grown successfully.

The number of sheep in the country and the amount of wool exported at certain census periods are as follows:

Year	Number of Sheep	Wool Exported	Value in £
	(millions)	Pounds (millions)	(thousands)
1838 . . . . .	1.5	3.8	.254
1874 . . . . .	11.7	46.8	2.833
1891 . . . . .	17.9	106.2	4.130
1901 . . . . .	20.2	146.8	3.699
1911 . . . . .	24.0	169.4	6.491
1916 . . . . .	24.8	185.5	12.386
1921 . . . . .	23.3	158.7	5.221
1926 . . . . .	24.9	213.2	11.830

**Frozen Produce.** With refrigeration, the real commercial development of New Zealand began. In 1882 the first cargo of frozen mutton from the dominion was placed on the British market. For many years there was a strong feeling among Britishers against refrigerated meat, but improved storage methods and the fact that the imported produce could be sold much cheaper than domestic meat gradually wore down prejudice until "Canterbury lamb" has be-

come almost an essential article of British diet. Butter and cheese, which also are dependent on cold storage, furnish more than one-third of New Zealand's total exports.

**Minerals.** New Zealand's gold mines are not as rich as they were. In 1925 the gold and silver output was worth about \$2,730,000. There are rich deposits of coal, iron and lime in close proximity for the development of the steel industry, and enormous deposits of iron sand on the North Island beaches. There are almost 5,000 men working in the coal mines; in 1927 the output was 2,366,740 tons.

**Commerce.** The commercial strength of New Zealand lies in her pastoral products, which constitute 94.2% of the exports. Forest resources provide 1.8% and mining 1.4%. In 1926 leading exports were wool, meat, skins, hides, pelts, gold, coal, gum, flax and timber, with decreasing shipments of flax and gold. The chief importations are motor vehicles and materials, textiles, clothing, machinery, iron, steel, chemicals, tobacco and petroleum.

**Inhabitants.** The population is almost wholly of British descent, English settlements occurring in North Island and Canterbury, and Scottish in Otago. The original natives, the Maoris, are supposed to have come to New Zealand several centuries ago from some of the islands between Samoa and Tahiti. Split up into two tribes, they speak a Polynesian dialect. Some have the fair Polynesian features, some are dusky brown with the long and broad Papuan nose, and others have the coarse features of the lower Melanesian races. These variations of type have not been explained, but it is supposed that the original inhabitants exterminated many men and took the handsomer women as wives. Internecine feuds after early wars have greatly reduced the Maori population.

**Education.** The education system is free, compulsory and secular for those from 7 to 14 years of age. It is possible for a pupil of average scholarship to progress from first grade to last years at the university entirely at the expense of the State. The University of New Zealand consists of Otago University at Dunedin, Canterbury University College at Christchurch, Victoria University College at Wellington and Auckland University College. H. A. A.

**Government:** In 1840 New Zealand was put under an autocratic governor; in 1853 the colony became self-governing. Until 1875 there were six provinces with considerable powers; since then the government has been centralized. Although interested, New Zealand, finally failed to join the Australian federation. The dominion government, as established in 1907, is vested in a governor-general appointed by the Crown and in a legislative council and a House of Representatives which constitute the General Assembly. The ministry is responsible to the House of Representatives.

New Zealand has long attracted attention because of its program of state socialism and its social legislation, dating from the last decade of the 19th cen-

tury. Liberal labor and industrial codes, extending to wage control, laws devised to break up large estates, pension provisions, state ownership and management of railways and other public utilities, the state monopoly of insurance, equalized taxation, an extended program of government experimentation and aid to education, and large-scale attempts at cooperative production and marketing, have made New Zealand something of a social laboratory. The franchise was extended to women in 1893.

**History:** Tasman, a Dutch explorer, seems to have been the first European to view New Zealand, in 1642. Captain James Cook charted the coasts of the islands in 1769 and returned for later visits. He found them populated by Maoris, intelligent but savage Polynesian invaders. The British government declined to annex New Zealand until 1840. The white population then approximated 2,000, composed of sealers, whalers, traders, fugitives, and missionaries who had turned settlers.

Systematic colonization followed under the guiding influence of Wakefield, already deeply interested in the settlement of the islands. Through Wakefield and the New Zealand Company, Wellington, Taranaki, Wanganui, Nelson, Otago, Canterbury, Auckland and Dunedin were settled during 1840-50. By 1850 Gov. George Grey had rescued the colony from financial straits and had taken vigorous measures to reduce the Maori menace. Wool growing had already become a major industry and sheep were increasing rapidly, but the country was isolated and such trade as existed was with Sydney, N.S.W. Gold rushes in the years following 1857 brought many settlers but only brief prosperity.

The middle years of the century were occupied with wars against the Maoris, incensed at the loss of their lands. Their strong resistance was overcome only by a combination of severe military defeats with the adoption of a more generous policy towards them, the success of which was attested by their loyal support of their conquerors in the Boer and World Wars, and in their contribution of several distinguished leaders to political life. In 1907 New Zealand was designated a Dominion.

The Dominion participated effectively in the World War, is a member of the League of Nations, and accepted a mandate over German Samoa. E. M. H.

**NEW ZEALAND FLAX** (*Phormium tenax*), a useful fiber plant of the lily family, numerous gardeners' varieties of which are widely grown as lawn ornamentals. The plant is a native of New Zealand where its strong fiber was extensively used by the Maoris for cloth and cordage when Captain Cook first landed. It is a very stout rigid perennial with narrow, dark green leaves, sometimes 9 ft. long and 5 in. wide, and reddish-purple flowerstalks, 5 to 15 ft. high, bearing numerous red or yellow flowers in terminal panicles. The cream-colored, glossy fiber, nearly as strong as abacá and used principally in cordage, forms a substantial article of export from New Zealand.

**NEW ZEALAND SPINACH** (*Tetragonia expansa*), a prostrate annual of the carpet-weed family often grown as a vegetable. The plant, a native of the Australian region, has escaped from gardens in various parts of the world. It has thick, somewhat fleshy stems often forming broad mats, and bears triangular leaves, inconspicuous yellow-green flowers and dry, horny, four-angled fruiting capsules. The young tender parts are used for salads and as a potherb.

**NEXO, MARTIN ANDERSEN** (1869- ), Danish novelist, was born at Copenhagen, June 26, 1869. He was brought up in extreme poverty and was early set to hard tasks. Later he attended the Folk High School at Askov. His writings show his deep sympathy with the poor and downtrodden. Perhaps the most famous of his novels is *Pelle the Conqueror*.

**NEY, MICHEL** (1769-1815), marshal of France and Duke of Elchingen, was born Jan. 10, 1769 at Saarlouis. He enlisted in a hussar regiment and distinguished himself by his courage and energy. After 1808 Ney accompanied Napoleon on his campaigns and became Prince of Moskawa and marshal of France. After the Restoration Ney offered his services to the Bourbons, but renewed his allegiance to Napoleon on his return from Elba and fought with him at Waterloo. Though advocating the return of the Bourbons towards the end of Napoleon's reign, he was found guilty of treason Dec. 6, 1815 and was shot.

**NEZ PERCÉ**, a North American Indian tribe, the most important of the Shahaptian linguistic stock. The name was applied by the French to some tribes which pierced their noses for the insertion of a shell ornament, but, curiously enough, the group under consideration did not practice nose piercing. Early in the 19th century the Nez Percé occupied a widespread section of western Idaho, northeastern Oregon and southeastern Washington on the lower Snake River and its branches. They now live at the Ft. Lapwai and Colville reservations in Idaho and Washington, respectively. Though possessing some intrusive culture traits typical of the Plains Indians, the Nez Percé in aboriginal days were distinctly of the Plateau area. They lived in communal houses, though there is also evidence of their having used the semi-subterranean house. Their main dependence for food was on the salmon, supplemented by roots and berries. The introduction of the horse, making hunting expeditions possible, widened their food horizon. The Nez Percé were loosely organized into villages, each with several chiefs having varying functions. Throughout their history their contacts with whites have been friendly, with one exception. The Nez Percé War of 1877, led by the famous Chief Joseph, was initiated through their refusal to accept the treaty confining them to the Lapwai Reservation. Following several defeats of the United States troops, Chief Joseph and his band were captured and sent to what was then Indian Territory, but later they were moved to the Colville Reservation in Washington.

**NGAMI**, a former lake of South Africa, lying north of the Kalahari Desert, 37 mi. long by about



15 mi. broad. Lake Ngami is now only a swamp due to interior desiccation and the capture of its water by the Zambezi. Water struggles into it from the Cubango marshes, and the Botletle, which may be quite a large stream in the wet season, carries water to some of the salt pans or *vleis*, as they are called in South Africa, which dot the region between here and the Cape. Explorers believe it possible that recent slight earth movements have helped to cut off water from Lake Ngami.

**NIAGARA FALLS** (formerly Suspension Bridge or Clifton), city and port of entry, Welland Co., Ontario, Canada, situated on the western bank of Niagara River, opposite the falls, 45 mi. southwest of Toronto, with which it is connected by trolley and boat service. It is an increasingly important center of the great hydroelectric development which supplies electricity to Toronto and other distant cities. Local manufactures of cereals, silverware, fertilizers, and cans are replacing the former industry of tourist accommodation. Niagara Falls is well-planned and built, having many public buildings, educational foundations and parks. Three steel bridges connect the city with the American city of the same name. Pop. 1921, 14,764; 1931, 19,046.

**NIAGARA FALLS**, a city of northwestern New York, situated in Niagara Co., on the Niagara River, about 25 mi. northwest of Buffalo. The transportation facilities include the Erie, the Lehigh Valley, the Michigan Central, the New York Central, P&E Marquette and Canadian National railways and bus and trolley lines. Due to water-power obtained from Niagara Falls, the city has become an important manufacturing center. Flour, paper, ferro alloys, chemicals and wheat biscuits rank among the chief products. In 1929 the value of manufactures was about \$131,000,000; the retail trade amounted to \$38,430,521. Thousands of tourists annually visit the Falls. Originally known as Manchester, the settlement soon adopted its present name, and in 1892 consolidated with the town of Suspension Bridge, obtaining at that time a city charter, which has since been amended. Pop. 1920, 50,760; 1930, 75,460.

**NIAGARA FALLS**, on the Niagara River, the waterway carrying the waters of Lake Erie and the upper Great Lakes to Lake Ontario. The celebrated falls are situated 13 mi. south of the mouth of the river, which at the head of the escarpment is divided by Goat Island, extending down the stream for a half mile. The American cataract, 167 ft. high with a generally straight crest about 1,030 ft. long, lies between the right bank and Goat Island, which is United States territory. Adjacent to the cataract on Goat Island is the narrow fall known as the Bridal Veil. On the west side, between the island and the Ontario shore, is Horseshoe Fall, its crest retreating in a deep curve around the main body of the Niagara River, which at this point drops 158 ft. over a concave escarpment 2,500 ft. long. The width here between the American and Canadian shores is 4,770 ft. About 90% of the Niagara waters flow over the

Horseshoe (Canadian) Falls. In its entire length of 34 mi. the Niagara River drops about 326 ft., the maximum fall (315) occurring in the intermediate course of the river, extending from a point 7 mi. above the falls. At this point the river is obstructed by the first cascades and rapids, which in the last half-mile above the cataract increase in number, culminating in the plunge on either side of Goat Island. Below the falls, whose average discharge is estimated at 15,000,000 cu. ft. per minute, the waters flow over a series of rapids, flanked by rocky cliffs, between 200 and 350 ft. high, comprising the gorge. This precipitous waterway leads to the Whirlpool, on the Canadian side, 3¼ mi. from the Horseshoe Falls. The water is shallow at the foot of the American cataract, plunging to a bed broken by masses of rock, but the bed of the Horseshoe Falls, over which the greater volume of water falls, is at several points equal in depth to the height of the escarpment. As a consequence of the depth below the Horseshoe Falls the water is relatively calm, so that small boats, including the historic *Maid of the Mist*, can approach the cataract on the Canadian side. The foregoing figures allow of changes from year to year, as the rapidity of the current both above and below Niagara Falls causes a variable erosion. For example, in 1842 the mean annual rate of recession in the center of the Horseshoe Falls was 3.7 ft. and since 1906 it has been estimated at 2.3 ft. The rate of recession of the escarpment of the American cataract is much less, due to the comparative narrowness of the stream. The rate of recession due to erosion is annually reduced by the increasing diversion of waters on both shores for hydroelectric power. This escarpment on the American side underwent a considerable physical change on Jan. 18, 1931 when a mass of rock, estimated to weigh 75,000 tons, fell to the basin, leaving a U-shaped dent in the river about 150 ft. deep and 150 ft. wide. The slide caused a heavier flow of water on the shore of the American mainland.

The geologic age of Niagara Falls admits of a wide variety of estimates, ranging from 12,000 to 100,000 years. In 1931 Prof. R. H. Pegrum of the University of Buffalo judged the age of Niagara at approximately 50,000 years, based on the annual rate of rock weathering of ¼ in. annually. In the Paleozoic era it was submerged by the sea lying west of the Appalachian land mass. As the waters receded the sediment hardened to rock, and when the melting of the great Canadian glacier exposed the west side of the Ontario basin the present gorge was gradually cut southward by process of erosion, giving the Niagara region a water outlet. The general belief is that originally the falls fell at Lewiston, 7 mi. below the present site. Gradually the flow of the water over the limestone and sandstone pushed the escarpment farther backward, forming the present gorge. Diversion of the water for hydroelectric power, and control of the flow by artificial means, will preserve the falls which, in the normal course of geologic processes, would degenerate into an extended cascade. A treaty agree-



## NEW ZEALAND

Area 103,862 sq. m.  
Pop. .... 1,521,887

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

#### Pop.—Thousands

5	Ashburton	N 11
217	Auckland	D 17
2	Balclutha	Q 7
5	Blenheim	J 15
2	Cambridge	E 18
2	Campbelltown	Q 5
2	Carterton	J 18
127	Christchurch	M 12
2	Dargaville	C 15
2	Drury	D 17
86	Dunedin	P 9
4	Feilding	I 13
2	Foxton	I 13
16	Gisborne	G 23
4	Gore Junction	Q 6
6	Greymouth	L 10
18	Hamilton	E 13
17	Hastings	H 21
1	Havelock	J 15
5	Hawera	H 16
3	Holditch	L 9
2	Huntly	E 13
1	Inglewood	G 16
24	Invercargill	Q 8
2	Kaipoi	M 12
1	Kaitangata	Q 7
3	Levin	I 13
4	Lyttelton	M 13
3	Marton	J 18
9	Masterton	J 18
2	Milton	Q 8
2	Morrinsville	E 18
2	Mosgiel Jc.	P 8
2	Motueka	J 13
19	Napier	H 21
12	Nelson	J 14
18	New Plymouth	G 15
8	Oamaru	Q 9
2	Ohakune	E 13
11	Onehunga	D 17
1	Orari	N 10
2	Paeroa	E 19
23	Palmerston North	I 18
10	Petone	J 17
1	Pictou	J 15
2	Rangiora	M 12
2	Reefton	K 11
5	Rotorua	F 20
1	Selwyn	M 12
1	Shannon	I 18
2	Sheffield	M 11
4	Stratford	G 16
2	Taumarunui	G 18
3	Tauranga	E 19
2	Te Aroha	E 19
2	Te Kuiti	F 17
5	Thames	D 18
18	Timaru	N 10
2	Waimate	N 10
25	Wanganui	H 17
143	Wellington	J 17
4	Westport	K 10
8	Whangarei	B 16

## TASMANIA

Area 26,215 sq. m.  
Pop. .... 215,540

### PRINCIPAL CITIES

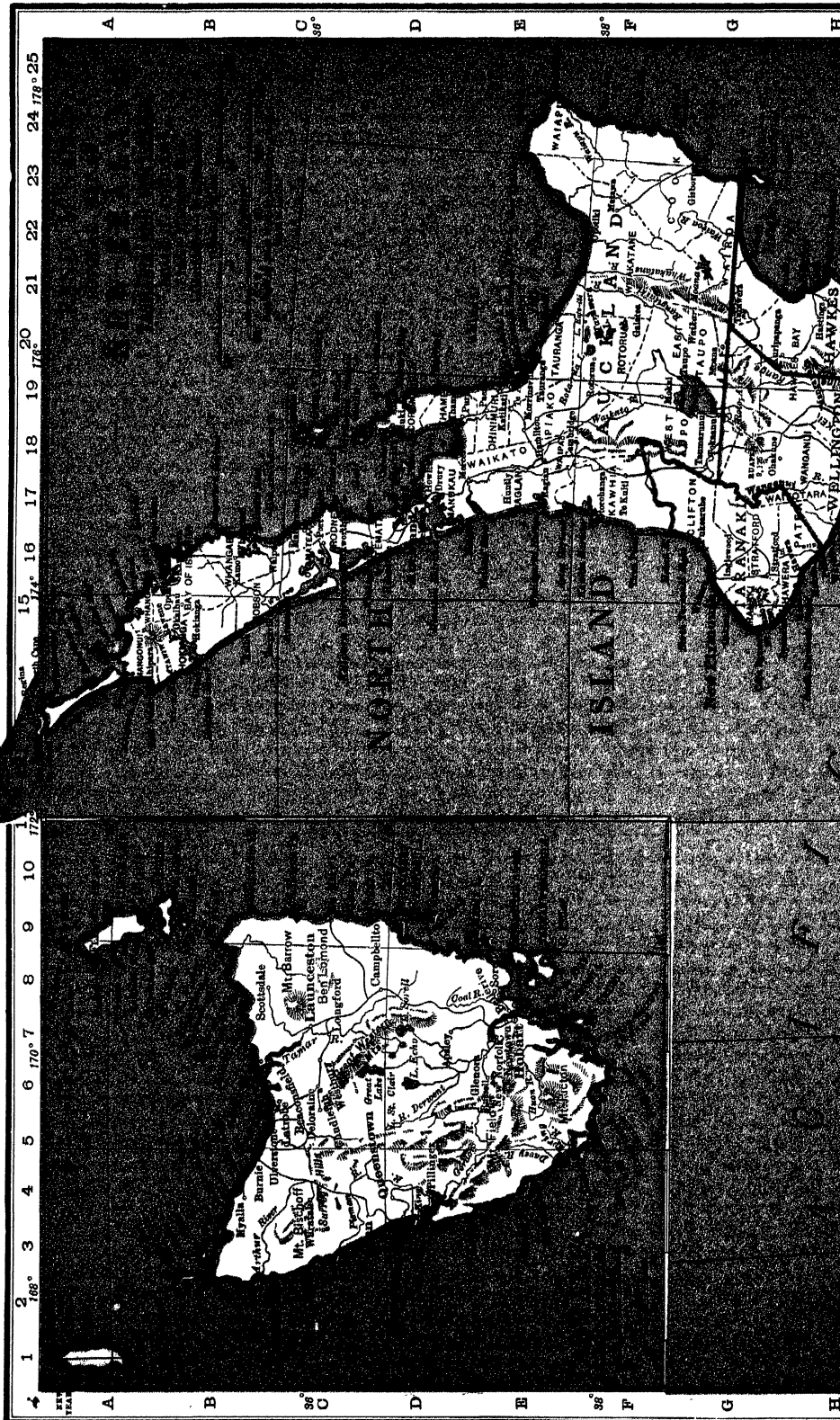
(Including Figures from Latest Population Estimates)

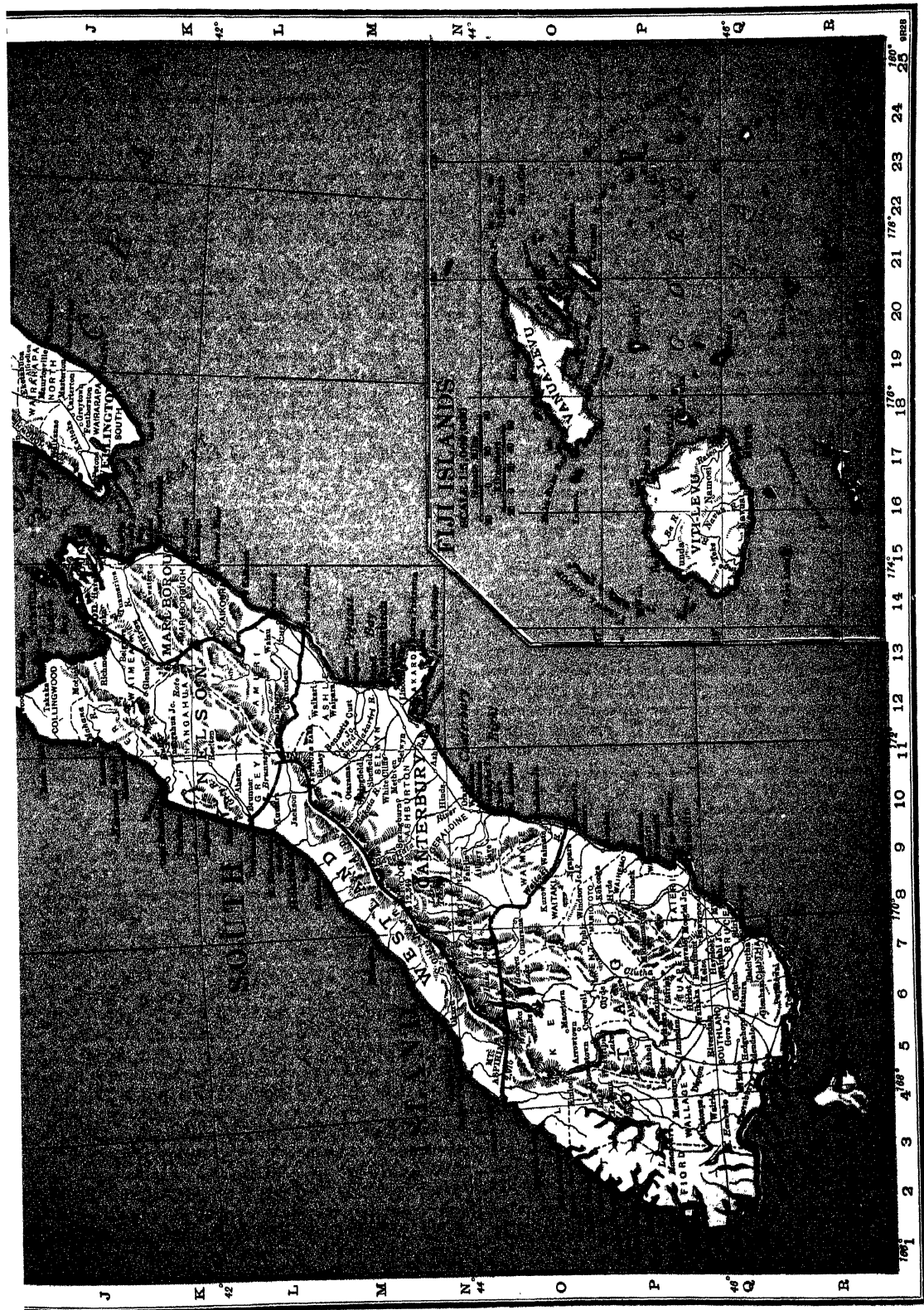
#### Pop.—Thousands

5	Beaconsfield	C 6
4	Burnie	B 5
2	Deloraine	C 6
5	Devonport	C 6
58	Hobart	E 7
2	Latrobe	C 8
31	Launceston	C 7
2	Queenstown	D 4
2	Scottsdale	C 8
2	Ulverstone	C 5
2	Zeehan	C 4

## FIJI ISLANDS

Area .. 7,083 sq. m.  
Pop. .... 180,000







ment between the United States and Canada limits the water diversion for power purposes on the Canadian side to 36,000 cu. ft. per second, and to 20,000 cu. ft. per second on the American side. In 1930 the three hydroelectric developments on the Canadian side were capable of producing 405,000 horse power; the Queenstown-Chippewa development on the American side with a power-house in the gorge, contained 9 units which had an aggregate capacity in 1930 of 550,000 horse power.

**NIAGARA RESERVATION**, a state park at Niagara Falls in western New York. The park was created in 1885 and comprises a total area of 509 acres. It includes the American side of the Falls, the Cave of the Winds beneath the cataract, Goat Island dividing the American and Canadian falls, Devil's Hole, Whirlpool Park overlooking the Whirlpool and the Upper and Lower Rapids; and 10 acres at Fort Gray. There are numerous concessions within the park such as steamboat lines and conducted tours to points of interest. The park is accessible by train, electric railroad, and bus from Buffalo and is also reached by excellent motor highways.

**NIAGARA UNIVERSITY**, a college for men conducted by the Vincentian Fathers near Niagara Falls, N.Y. Founded in 1856 and chartered in 1863 as the Seminary of Our Lady of Angels, it was erected by the State Regents under its present title in 1883. Preparatory and graduate schools and the theological department of the seminary are maintained in connection with the university, which offers a college course in arts and sciences. The productive funds in 1931 were estimated at \$300,000. The library contained 25,000 volumes. In 1931-32 the registration was 700. The faculty of 48 was headed by Pres. John J. O'Byrne.

**NIBELUNGEN, RING OF THE**, a cycle of four operas by RICHARD WAGNER who, according to his invariable custom, wrote his own libretti which in this instance were based on mythological Norse tales called Eddas. The four operas composing this tetralogy, known in German as *Der Ring des Nibelungen*, are, in the order of their arrangement, *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Die Götterdämmerung*. As early as 1853, when Wagner was forty years old, he had completed the libretti; in 1854 the score of the first opera was completed, and by 1857 he had finished scoring *Die Walküre* and was half through *Siegfried* when, disheartened by public indifference toward his earlier operas and appalled by the difficulty of getting a production of his massive opus, he tentatively abandoned the scheme upon which he had set his heart, and composed *Tristan und Isolde*. Optimistically he called this *eine Handlung* (an action) which was six years in securing presentation. Fortunately, in 1864, by that time nearly desperate, Wagner secured the patronage of King Ludwig II of Bavaria. *Siegfried* was completed in 1869, and in 1874, when *Die Götterdämmerung* received its finishing touches, the serial masterpiece was finally completed—twenty-six years after its inception. Under the baton of Hans

Richter the world première of the complete cycle took place in Bayreuth on August 13, 14, 15 and 17, 1876; in the United States the complete work was first performed (with the omission of *Das Rheingold*) in New York, January and February, 1888, although *Die Walküre* was heard there as early as 1877. It was first performed *in toto* on March 4, 5, 8 and 11, 1889; in London it had its première in 1882. As indicated below, the first two operas of the cycle were produced prior to the première of complete cycle. Save for the first, which is in four acts, all of the operas are in three acts, though the last is introduced by a prologue.

With *Der Ring des Nibelungen*, viewed as a whole, none of Wagner's other music-dramas can be compared fairly, even though the separate works composing the cycle have serious rivals in his independent creations; for, so viewed, as it was intended to be, the *Ring* is strictly incomparable. It is a *tour de force* of the supreme master of dramatic music, a ballad of the gods opening lyrically with the Rhine maidens guarding the gold secreted under that river, proceeding ominously as the golden curse extends its power, and closing tragically in the dusk and dissolution of the gods themselves when Walhalla, their abode, goes up in flame and horror and falls in ashes.

**Das Rheingold** (première, Munich, 1869). Beneath the Rhine dwell the Rhine-daughters, Woglinde, Wellgunde and Flosshilde, whose duty is to guard the magic Rhine-gold; a fabulous metal that, when fashioned into a ring, makes the wearer ruler of the world provided he has renounced love forever. The Nibelungs, a race of cunning gnomes dwelling in the bowels of the earth, wish to obtain possession of this magic substance. Their prince, Alberich, invades the Rhine, at first flirting with the Rhine-daughters and then, when this fails, boldly seizing the Rhine-gold and carrying it off. He makes a ring of it and becomes lord of the world. Meanwhile, the god Wotan and his wife Fricka have promised the beautiful goddess Freia to two giants, Fasolt and Fafner, as payment for building the castle of Walhalla. In retribution for making such a promise Wotan and Fricka immediately begin to age since Freia's golden apples, which preserve the youth of the gods, wither as soon as Freia has departed. However, since Fasolt and Fafner covet the Rhine-gold, they agree to hold Freia in ransom only until Wotan secures the ring from the Nibelung Alberich: when the ring is given to the giants they will return Freia. Assisted by Loge, the fire god, Wotan hastens to Nibelheim where Alberich dwells, overpowering the gnome and wresting the ring from him. Frantic over his loss, Alberich calls down an eternal curse on all who carry the golden ring until it is returned to its rightful owner. Wotan then receives back Freia, giving the ring to the giants, according to promise. But Alberich's curse begins to take effect at once, since the new owners quarrel over their booty, and Fafner slays Fasolt, carrying off the plunder.

**Die Walküre** (première, Munich, 1870, New York, 1877). One of Wotan's nine daughters by Erda, god-

dess of the earth, is Brunnhilde, a Valkyrie or battle-maiden (derived from the Norse *val*, a heap of slaughtered men, and *kjora*, to choose). The mission of the Valkyries is to select dead heroes on the field of battle and take them to Walhalla where, if occasion arise, they will defend it. But while the Valkyries are industrious in this mission, Wotan is uneasy and privately troubled. The curse of Alberich still haunts him; he wishes to see the Rhine-gold restored to the Rhine-daughters. Unfortunately, Fafner has changed himself into a dragon who cannot be slain save by a human being who does not lust after power as do the gods. Wotan, therefore, visits the earth in disguise, begetting twins named Siegmund and Sieglinde; at the same time he forges a sword which he drives hilt-deep into an ash tree. In order to protect his sister who has been forced into marriage with Hunding, Siegmund draws forth the magic sword called Nothung and battles with Hunding. Wotan orders Brunnhilde not to interfere, but she disobeys and is turned into a common mortal. She is placed on a mountain-top surrounded by a ring of fire so that none but a hero can reach her. Siegmund is defeated by Hunding, and Sieglinde is carried off by Brunnhilde before Brunnhilde is punished.

**Siegfried** (première, Bayreuth, 1876). Many years have passed meanwhile, and Sieglinde has died giving birth to a son, Siegfried, who has grown to manhood. The Nibelung dwarf Mime has carefully nurtured him, hoping that his charge will slay the dragon Fafner and wrest the gold ring from its possession. He intends to drug Siegfried afterward and thus get his own hands on the magic talisman. Out of the fragments of Wotan's sword Siegfried forges a new sword and presently slays Fafner. But no sooner has he touched his lips to the dragon's blood than he finds that he can understand the song of birds who warn him of Mime's crafty purpose. With the same sword he therefore kills Mime, and then, journeying to the mountain-top where Brunnhilde awaits release by a hero, he fearlessly passes through the fiery ring encompassing her, awakens her with a kiss, and persuades the beautiful Valkyrie to marry him.

**Die Götterdämmerung** (première, Bayreuth, 1876). Happily married to Brunnhilde, Siegfried presently fares forth on heroic missions, leaving his bride within the fiery ring for protection. She gives him her horse, Grane, while he places the golden ring in her possession. Meanwhile Hagen, the son of Alberich, has designs on the golden ring which his father long since stole from the Rhine-daughters. Consequently he plots to this end. He persuades Gunther's sister, Gutrune, to prepare a love philter for Siegfried, and when Siegfried reaches Gunther's court he is given this. At once he forgets Brunnhilde, and his love for her vanishes in an overwhelming infatuation for Gutrune. In order to win Gunther's consent to a marriage between Gutrune and Siegfried, the crafty Hagen arranges that the latter go to Brunnhilde and persuade her to marry Gunther. This Siegfried readily consents to do. He assumes

the appearance of Gunther, goes to Brunnhilde, wrests the golden ring from her finger, and brings her back to Gunther's court. Pretending to be Brunnhilde's friend, Hagen now reveals Siegfried's duplicity, whereupon the Valkyrie, overcome by despair, tells the dwarf that Siegfried is vulnerable in the back. Hagen stabs the warrior whose body is carried back to Gunther's castle. The dwarf now demands the ring which still encircles the finger of the dead Siegfried. Gunther considers the ring his own property, and thereupon is slain by Hagen. Still intent upon getting it in his possession, Hagen tries to snatch it from Siegfried's finger, but the dead hand raises itself slowly in horrible warning, and at the same moment Brunnhilde appears. She orders a funeral pyre built, and with her own hand applies the torch. As the flames ascend about Siegfried's body she leaps upon her horse, charging headlong into the mounting holocaust. In the same instant the waters of the Rhine begin to ascend, bearing upward the Rhine-daughters who seize the golden ring and drag down Hagen who leaps into the flood after it. The dusk of the gods, who had put gold before love, is approaching. The skies flare up in red fury, a premonition of oncoming darkness, and Walhalla itself is destroyed in this "Twilight of the Gods."

**NICAËA**, an ancient city of Asia Minor on Lake Ascania in Bithynia. The city was built in 316 B.C. by Antigonos who called it Antigonea, but Lysimachus changed the name to Nicaea in honor of his wife. It was the residence of the kings of Bithynia. Situated at the junction of some of the chief roads through Asia Minor to Constantinople, Nicaea was of great commercial importance. The Christian church held two ecumenical councils here, one of which drew up the Nicene Creed, and the other, held in 787, deciding on the worship of images. The same year Nicaea was destroyed by earthquake, but was later rebuilt, never to resume its old importance again. See also **NICENE CREED**.

**NICAËA, COUNCILS OF**, two ecumenical councils held at Nicaea, in Bythinia, Asia Minor. The first ecumenical council was called by the Emperor Constantine in 325, principally to settle the doctrinal strife arising from **ARIANISM**. The number of attending bishops is variously given; Athanasius places it at 318, Eusebius at 250. Three parties were represented in the council: the Arians, the Athanasians, and those who, like Eusebius of Caesaria, took a middle course. At the end of its deliberations the council promulgated a creed which served as the framework of the present Nicene Creed. Condemning Arianism, it declared God the Father and God the Son to be of the same substance (*homocusia*), and that Christ was not a creature, having existed externally. Arius and two bishops who refused to desert him were excommunicated. The council also passed on the Easter controversy, deciding that Easter be observed on the Sunday following the feast of the Jewish Passover, and on various matters of Church discipline. The second Nicene Council met first at Constantinople in



786, but reassembled at Nicaea the following year, for the purpose of settling the Iconoclastic controversy. It condemned Iconoclasm, pronounced in favor of the use of images and pictures in churches, and also passed a number of disciplinary canons.

**NICANDER** (2nd century B.C.), Greek poet and physician, was born at Claros in Asia Minor, in the 2nd century B.C. He was an authority on toxicology, and his *Alexipharmaca* deals with poisons and their antidotes. More important, however, is his long hexameter poem called *Theriaca* and describing cures for wounds inflicted by animals. Ovid is said to have copied a lost epic by Nicander. Fragments of his *Georgica* and *Melissourgica* are extant.

**NICARAGUA**, a republic of Central America, lying between the Caribbean Sea (coastline 280 mi.) and the Pacific Ocean (200 mi.), with Honduras on the north and Costa Rica on the south. Area about 50,000 sq. mi. Est. pop. 1930, 750,000. MANAGUA, pop. 1929, 50,000, is the capital.

A range of volcanic mountains, the Cordillera de los Andes, runs through the center of the country from northwest to southeast. Another range of volcanic peaks lies to the west of the Andes, but this has no physical connection with the Andean system of South America. The country may be divided into three zones: the seaboard, the uplands of the interior and the coastlands between Nicaragua and Managua lakes and the Pacific. Parallel with the shore at distances of from 3 to 8 mi. extends a nearly continuous fringe of coral reefs and islands, the latter seldom more than a few hundred feet long and covered with coconut palm groves. The Cordillera de los Andes, with a maximum height of about 7,000 ft. descends in long terraced inclines towards the Atlantic. Lake Nicaragua is 92 mi. long by 34 mi. wide. Lake MANAGUA, situated but a short distance from Lake Nicaragua with which it is connected by the Tipitapa River, is about 33 mi. long and 16 mi. wide. Both are about 135 ft. above sea level. The route for the projected canal from the Atlantic to the Pacific would utilize Lake Nicaragua and the San Juan River which flows east from the lake to the Caribbean. The Bluefields River is navigable for 60 mi. from its mouth. The longest river of the country is the Coco or Segovia which rises in the eastern cordillera and traverses 300 mi. to empty into the Caribbean Sea; it is navigable for 110 mi. by light-draft vessels.

The climate is mild in the mountain regions but elsewhere is distinctly tropical, with a rainy season from May to November. The mean annual temperature is about 80° F., showing slight deviations from month to month. The mean annual rainfall exceeds 100 in. in the Rivas district; elsewhere it falls to about 90 in. in summer and to 10 or under in winter.

Each of the three physical zones has its special vegetable products. The pitch pine and mahogany forests are mainly confined to the marshy seaboard, the rubber-yielding plants of this region range farther inland. The fertile volcanic zone yields crops of

corn, sugar, tobacco, bananas and coffee. The extensive forest tracts of the central provinces abound in cedars, rosewood, ironwood, vanilla, sarsaparilla, logwood and other dyewoods and medicinal plants. The tropical flora, especially of the Nindirí district and some parts of the volcanic zone, are of great beauty, exuberance and variety.

The wild fauna differs in few respects from that of the neighboring lands. In the forests are the jaguar, puma and ocelot; alligators swarm in the lakes and most of the rivers, and the presence of a species of freshwater shark indicates that Lake Nicaragua once communicated with the Pacific. Vultures and humming birds are plentiful. Among the reptiles are the python and black snake, the harmless boba and the deadly corali, taboba and rattlesnake.

Corn is the chief product of the country, although none is exported. Sugar cane and bananas are successfully cultivated on the east coast. Coffee is grown on the mountain slopes. Cacao ranks in importance among the cultivated resources of western Nicaragua. The chief exports are coffee, sugar, bananas, timber and hides; imports, textiles, machinery, flour and chemicals. A small amount of gold is mined on the Atlantic slope, but Nicaragua is essentially an agricultural and stock raising country. Manufacturing industries are confined mainly to articles of domestic consumption.

There are several thousands of the inhabitants officially classed as *Bravos*, that is, wild, semi-independent tribes scattered in small groups over the wooded tracts in the central part of the republic. Between these extensive unsettled districts the Mosquito Coast is occupied by several thousands of Mosquito Indians, who stand at a considerably higher level of culture than the *Bravos*, but have been citizens of Nicaragua only since 1894, when the Mosquito Reserve was definitely incorporated with the territory of the republic. All the rest of the people, except a few *mestizos*, constitute the Nicaraguan nationality in the strict sense of the term. Like the other Hispano-American nationalities they form more or less civilized settled communities of Spanish speech, religion and general culture.

Nicaragua has not progressed as rapidly as other Central American republics, chiefly because of the frequent revolutions which prevent development of useful industries and impoverish the people. In recent years the United States has kept a body of marines in the country to preserve the peace and to ensure lawful election of officers. Clashes between the Nicaragua National Guard assisted by a small force of United States Marines, and the bandit Sandino and his followers were frequent in the 1920's and 1930's. The country has known little respite from internal and external troubles since 1823 when Nicaragua joined the Central American Confederation. (See CENTRAL AMERICA.) The Constitution of 1912, since amended, provides for a congress of two houses, a senate and house of deputies. The president has a council of five ministers.



## HISTORY

In 1522 Gil Conzalez de Avila first explored the Pacific coast of Nicaragua; his pilot, Alonzo Nino, discovered Fonseca Bay. The characteristic colonial processes of conquest and Christianization were rapidly effected. Pedrarias Davila was the first governor of the province, and under his auspices the cities of Granada and Leon were founded in 1524. Throughout the Spanish era Nicaragua was a part of the captaincy general of Guatemala; the city of Leon was capital of the province. Nicaragua declared its independence of Spain in 1821, and was successively part of Iturbide's Mexican empire and one of the United Provinces of Central America.

A constituent assembly at Managua declared Nicaragua an independent sovereignty, Apr. 30, 1838. Intense political rivalry early became a major factor in its political history; Granada and Leon, rivals since early colonial days, became the centers of Conservative and Liberal strength respectively. The capital of the republic frequently shifted between Leo and Managua, a Conservative stronghold, as political authority changed hands. Corruption attending the traffic across Nicaragua along the San Juan River route, during the gold rush days of California, added to the political demoralization. The Tennessee adventurer, WILLIAM WALKER, was a spectacular figure in the Nicaraguan scene from 1855 until his death in 1860. After 30 years of Conservative control, during which the capital was permanently located at Managua, José Santos Zelaya in 1893 began a 16 years' dictatorship. His regime was characterized by brazen speculations and by mischievous intrigue in the politics of other Latin-American nations. Zelaya resigned during a civil war in 1909; the Conservatives, having regained power, faced demands of foreign creditors greatly exceeding the revenues. American assistance was solicited; a plan of financial reform drafted by Thomas C. Dawson was put into operation. When the Conservative Government was threatened by factional warfare in 1912, the United States dispatched marines to Nicaragua. The marine guard was withdrawn in Aug. 1925, but restored in the following spring. Sandino, an intransigent Liberal, waged a strenuous war until he was driven into exile in 1929. Particularly because of its project to build a trans-oceanic canal across Nicaragua, the United States has maintained an active interest in the affairs of the smaller republic.

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**NICARAGUA, LAKE**, the largest lake in Nicaragua, Central America. It lies within 13 mi. of the Pacific Ocean at about 140 ft. above sea level and has an area of approximately 3,700 sq. mi. From northwest to southeast its length is 100 mi. with a mean breadth of 40 mi. The depth varies from 10 ft. at the southeast corner to over 200 ft. in the deepest parts. From its southeastern extremity the

river San Juan flows into the Caribbean Sea, and at its northwestern end it is connected with Managua Lake by Tipitapa River which has a depth of 6 to 12 ft. in the rainy season but at other times is mostly dry. At one time the two lakes formed a continuous sheet of water. In Lake Nicaragua are several rugged islands, chiefly Ometepe which has twin volcanoes, Alta Gracia and Madera, both about 5,000 ft. high. Granada is the chief town on the lake.

**NICCOLITE**, a light copper-red mineral of metallic appearance composed of nickel and arsenic, and an ORE of nickel. It usually occurs massive, and sometimes reniform with a columnar structure, rarely in hexagonal crystals, and often accompanies cobalt, silver and copper. Niccolite is found in Sweden, Cornwall, Saxony and the Argentine. The nickel deposits of Sudbury and the silver and cobalt deposits near Cobalt, both in Canada, also contain niccolite. The name is derived from *niccolum*, Latin for nickel. See also HEXAGONAL SYSTEM; ORE DEPOSITS.

**NICE**, the chief city of the French Riviera situated on the Mediterranean. A very old town, it passed back and forth among rival princes through the Middle Ages and virtually down to 1860 when, having been a part of the kingdom of Sardinia, it was joined to France together with the rest of Savoy. Nice is now the capital of the department of the Alpes-Maritimes and is one of the world's best known climatic resorts. The season lasts from January until April but the autumn is also popular. Nice has coastal trade and the industries include the local specialties of perfume, oil and soap. Pop. 1931, 219,549.

**NICENE CREED**, an important summary of the chief articles of the Christian faith, thought to have been founded on a baptismal confession used by the Church in Caesarea, Palestine. It was made authoritative by the Nicene Council in 325. It is sometimes referred to as the Nicene-Constantinopolitan Creed, its present form being a revision of the creed of the Nicene Council, presented by Cyril of Jerusalem to the Council of Constantinople in 381 and by it adopted. At the Council of Toledo, 589, the Western Church added the famous *Filioque* clause and made other minor changes. To-day the Nicene Creed is almost universally accepted as ecumenical by Christians of all confessions, including the Roman and Greek Catholics, the Copts, the Nestorians, the Jacobites and many of the Protestant churches. It has also served as a base on which a number of the later famous creeds of Christendom have been founded.

**NICHOLAS, ST.** (4th century), bishop of Myra in Asia Minor, Lycia, and patron saint of Russia and of children, is supposed to have lived in the time of the Emperor Diocletian and to have been persecuted and martyred after becoming bishop of Myra. The facts about his life and death are exceedingly obscure and cannot be disentangled from the mass of legendary material that has grown up about his name.

Although his feast day is kept by both the Greek and Roman Church on Dec. 6, the custom of secretly giving gifts on St. Nicholas Eve has been transferred

# NICARAGUA



PHOTOS FROM R. I. NESMITH AND ASSOCIATES

## SCENES IN MANAGUA, CAPITAL OF NICARAGUA

1. Street scene in the business district. 2. Grand Hotel Lupone, the finest in the Republic.



to Christmas. Through the instrumentality of the early Dutch colonists the name St. Nicholas was corrupted into the American form "Santa Claus."

**NICHOLAS**, name of five popes and one antipope. St. Nicholas I, 858-867, the perfect embodiment of the traditional papal policy, gained prestige for the papacy, but the breach between the Eastern and Western churches was widened by the excommunication of the patriarch of Constantinople, who had violated ecclesiastical law. Nicholas II, 1058-61, was elected, it is claimed, under Hildebrand's direction and carried out his policies. Nicholas III, 1277-80, brought about a compromise between Rudolph of Hapsburg and Charles of Anjou, and thus freed Rome from foreign overlordship. Nicholas IV, 1288-92, sent missionaries to China and to the Tartars, and tried in vain to organize a new crusade. Nicholas V, set up as antipope to John XXII by Lewis the Bavarian, submitted to John, 1330, and died in prison in 1333. Nicholas V, 1447-55, a patron of the arts, furthered greatly the study of the classics and enriched the Vatican Library with rare manuscripts. The Basel Council was closed by him and he also persuaded the antipope Felix V to resign.

See H. K. Mann, *Lives of the Popes in the Early Middle Ages*, 1902; H. Grisar, *History of Rome and the Popes of the Middle Ages*, 1911.

**NICHOLAS I (PAVLOVICH)** (1796-1855), Emperor of Russia and third son of Emperor Paul I, was born at Tsarskoye-Selo, June 25, 1796. The death of his brother Alexander in 1825 and the renunciation of the throne by his brother Constantine made Nicholas emperor. He suppressed the Decembrist uprising; warred against Persia, 1826-28, and against Turkey, 1827-29. He suppressed the rebellion in Poland, 1830-31; helped Austria put down the Hungarian revolt in 1849; and started the Crimean War by opening hostilities against Turkey in 1853. During the war, he died at St. Petersburg, Mar. 2, 1855.

**NICHOLAS II** (1868-1918), tsar of Russia, was born at St. Petersburg on May 18, 1868. He was the eldest son of Alexander III, whom he succeeded on Nov. 1, 1894. On Nov. 26, 1894, he married Princess Alexandra Alix of Hesse, and was crowned in May 1896, with great pomp in St. Petersburg. At the beginning of his reign he was hailed as a liberal, and he proclaimed that his policy would be one of peace. He opened negotiations with other European powers which led to the first Peace Conference at The Hague in 1899. However, he proved to be a weak and vacillating ruler, strongly influenced by courtiers and officials and particularly by the tsarina, who was under the evil domination of the monk RASPUTIN. (See RUSSIA.) Before the outbreak of the World War he made feeble attempts to keep the peace in Europe, but failed to check the chauvinistic pan-Slavs or to understand the great forces that were soon to bring on the revolution. Despite Russian successes against the Austrians in Galicia in 1914, the severe defeats at Tannenberg and the Masurian Lakes shook the monarchy to its foun-

datations, while the crushing blows of Mackensen's advance in 1915 and the evacuation of the entire Warsaw sector made recovery impossible. Gradually internal disorders, defeatism and revolution set in, and on Mar. 15, 1917, Nicholas was forced by the Duma to abdicate. He and his family were immediately imprisoned, and later were transferred to Ekaterinburg where they were executed by order of the local Soviet government on July 16, 1918.

**NICHOLAS NICKLEBY**, a melodramatic novel by CHARLES DICKENS; published 1839. After a childhood notable for the neglect he receives from an eccentric mother, Nicholas Nickleby becomes an usher at Dotheboys Hall, a wretched private school maintained by the villainous Squeers and his equally hard-hearted wife. Unable to endure the cruelty of Squeers, the hero departs from Dotheboys Hall, followed by one Smike, whose life is wrapped in mystery, and joins for a time the theatrical troupe of Vincent Crummles. But good fortune comes to Nicholas only when he becomes a clerk in the business of the Cheeryble brothers. Finding prosperity eventually and, in Madeline Bray, a pretty wife, he at last sees his rapacious uncle brought to justice. Kate Nickleby is an important minor character, as is also the old clerk, Newman Noggs.

**NICHOLS, EDWARD LEAMINGTON** (1854- ), American physicist, born at Leamington, England, Sept. 14, 1854. He was graduated from Cornell University in 1875. He continued his studies at the universities of Leipzig, Berlin and Göttingen, and after some work in 1880-81 with Thomas Edison he became professor of physics and chemistry at the Central University of Kentucky in 1881. In 1883 he was appointed professor of physics and astronomy at the University of Kansas and in 1887 professor at Cornell. In 1893 he became editor of the *Physical Review*. He has written many monographs and several textbooks, among them *Outlines of Physics*, 1897, and was co-author of *Cathodo-Luminescence*, 1928.

**NICHOLS, JOHN TREADWELL** (1883- ), American ichthyologist, born in Jamaica Plain, Mass., June 11, 1883. He graduated from Harvard with an A.B. degree in 1906. The following year, he became associated with the American Museum of Natural History in New York City as an assistant in the department of mammals. During the next year, he was an assistant in the U.S. Bureau of Fisheries and then he returned to the American Museum, where he was an assistant in the department of fishes from 1909 to 1918, and he has continued as an associate in the same department since 1919. He is the author of the book, *Fishes of the Vicinity of New York City*, 1918.

**NICHOLSON, MEREDITH** (1866- ), American author, was born in Crawfordsville, Ind., Dec. 9, 1866, and educated in the Indianapolis public schools. In 1886 he became a reporter for the Indianapolis *News* with which he remained 10 years. His first independent writing was poetry which attracted the attention of JAMES WHITCOMB RILEY. Later he pub-

lished essays, plays and several novels. *The Hoosiers* was included in National Studies in American Letters, and *The House of a Thousand Candles*, 1905, was widely read. Other well-known works by Nicholson are *The Port of Missing Men*, 1907, and *Old Familiar Faces*, 1929.

**NICIAS** (died 414 B.C.), Athenian general and statesman. The political opponent of CLEON, he negotiated in 421 the Peace of Nicias bringing to an end the first phase of the PELOPONNESIAN WAR. Despite his opposition to the Sicilian expedition undertaken by Athens, he was appointed to command it together with ALCIBIADES and Lamachus. On the recall of Alcibiades and the death of Lamachus he was left supreme. How far the disaster which overtook the Athenians at Syracuse should be attributed to his over cautious generalship it is impossible to estimate. Captured by the Syracusans 414 B.C., Nicias was put to death.

**NICKEL.** Nickel is a metallic element with white metallic luster, symbol Ni. It is strong and malleable. Its specific gravity is 8.85; melting point 1450° C., and ultimate strength 65,000-140,000 lbs. per sq. in. The world's production in the peak year of 1929 was 65,000 short tons.

**Metallurgy.** Nickel is widely present in the earth's surface in low concentrations, but valuable deposits are few. Most of the world's supply now comes from ores near Sudbury, Ontario, which were discovered and developed in cutting the Canadian Pacific Railway through the district in 1883-1886. The nickel occurs as sulphide (in pentlandite) with sulphides of copper (in chalcopyrite) and iron (pyrrhotite). These ores are associated with a cup-shaped igneous intrusion in complex Pre-Cambrian rocks. They are either part of the intrusion or a later deposit from solution.

Ore is mined from immense lens-shaped deposits at depths as great as 3,000 ft., principally by cut and fill or shrinkage stoping. At the surface, ore is crushed and concentrated by oil flotation. Concentrated ore is roasted in multiple hearth furnaces, smelted in reverberatories and blown in converters to a matte of copper and nickel containing about 20% sulphur. The copper and nickel are separated by cupola smelting with niter-cake, the resulting nickel sulphide is leached, roasted, melted and refined by electrolysis. Valuable amounts of precious metals are obtained in refining.

Electroplated nickel surfaces on hardware and bright parts are common, and consume a small fraction of the world's production. Chromium plate (*see* CHROMIUM PLATING) is usually underlaid with heavy nickel electroplate to make it durable.

**Nickel Alloys.** Nickel is principally useful for its alloying properties with other metals. The largest use of nickel is in rolled, drawn and forged steels containing ½-7% nickel. Such steels (*see* NICKEL STEEL), usually strong and tough due to the nickel content, are useful in motor and railroad construction, in various machines, tools and power devices. Such

additions of nickel also improve the strength and toughness of cast steel as in cast steel locomotive frames. The presence of 1-5% nickel improves the machinability, strength and uniformity of iron castings, in larger amounts it makes them corrosion resistant.

A recent expanding use is as a constituent of "stainless" alloys now being adopted for cutlery, utensils, architectural, vehicle and boat trim, and power and chemical apparatus. Nickel (7-35%) enhances the corrosion resistance produced by chromium, makes the steels more workable, and prevents internal deterioration.

As an iron alloy in amounts from 10-25%, nickel prevents magnetic induction, giving non-magnetic steels and cast irons for electrical work. In interesting contrast amounts from 45-80% with iron give high permeability, and form a necessary material in contemporary advance in communicative and electrical power devices.

In alloys with metals other than iron, nickel gives good corrosion resistance and pleasing white metallic luster. Alloys with chromium have high electrical resistance and resistance to high temperatures, and are used as heating elements and furnace parts. "White" gold is produced by adding 15% of nickel, and other colors by smaller amounts. Twenty-five per cent of nickel in copper gives the U.S. five cent piece its white color.

After iron, nickel alloys with copper are most common. Alloys of copper with 15-30% nickel are corrosion resistant, strong, and can be heavily cold-rolled and drawn into such forms as condenser tubes and resistance wire. When zinc is also present the resulting alloy is called nickel silver or GERMAN SILVER and used for silver plated ware, hardware, plumbing fixtures, and architectural trim. About 45% of nickel (no zinc) gives a very white alloy sheet. A similar composition in wire is valuable electrically because its resistance is constant when temperature varies.

Alloys consisting mainly of nickel have extremely good corrosion resistance, strength and durable color. MONEL METAL is the most important of these. Pure malleable nickel is itself only slightly less strong and corrosion resistant than Monel metal. From it are manufactured internal parts of radio tubes, coins, laboratory equipment, milk pasteurizers and tanks and caustic evaporators. Sheets of nickel bond with steel under temperature and pressure to form a strong plate with corrosion resistant surface. With 4% of manganese rolled nickel is resistant to heat and burning gases as in spark plug electrodes.

R. J. McK.

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**NICKEL STEEL**, a term applied to steels containing .10 to .55% carbon, .30 to .80% manganese and .40 to 5.25% nickel. Steel alloyed with nickel increases its elastic limit 4000 lbs. per sq. in., for each

1% added up to 8, retaining good ductility. Nickel greatly improves fatigue life, impact, and resistance to corrosion; and also promotes grain refinement.

Nickel steel is valuable for structural purposes, wire cable, engine shafts, and boiler plates too large for heat treating by quenching. Alloyed with 0.50 to 1.75% chromium it is widely used for heat treated auto and aircraft engine parts.

Nickel steels containing large percentages of nickel are known in the trade as elinvar, invar and platinite; and a nickel iron as permalloy. Elinvar, 34% nickel with 12% of chromium has zero thermo-elastic coefficient between  $-100^{\circ}$  C. and  $100^{\circ}$  C., and is used for high grade watch and clock movements. Invar, containing 36% nickel, has zero coefficient of expansion to  $100^{\circ}$  C., and is used for measuring tapes and chronometer parts. Platinite, containing 46% nickel, has the same coefficient of expansion as glass and is used as a platinum substitute in electric light bulbs. Permalloy, a 78.5% nickel-iron alloy, has high permeability and low hysteresis in low field strengths these properties making it suitable for telephone and submarine cables.

C. M. J.

**NICOBAR ISLANDS**, a group of 21 British islands in the Indian Ocean, lying about 75 miles south of Andaman Islands, to which they are attached for purposes of administration. The Nicobars cover an area of 635 sq. mi. The largest are Great Nicobar and Camorta. The soil is fertile and covered with trees. Coconuts grow in profusion. Oranges, tobacco and sugar-cane are cultivated. The chief export is copra.

**NICOLET, JEAN** (c. 1598-1642), French explorer of the Great Lakes and the upper Mississippi region, a trader and resident among the western Indians. Nicolet went to New France in 1618, and spent two years among the Algonquins on the upper Ottawa and Lake Nipissing, learning native customs and language. He remained among the Indians during the English occupation of Quebec. CHAMPLAIN, on his return to Quebec, instructed Nicolet to establish friendly relations between the Winnebago Indians, then inhabiting Green Bay, and the Hurons, for the benefit of the fur trade. Nicolet and seven Hurons in 1534 traveled from Georgian Bay to Michilimackinac, thence to Green Bay so that Nicolet was probably the first European to enter Lake Michigan. He traversed the Winnebago country, meeting possibly 5,000 Indians at the various feasts, and secured the desired treaty. Nicolet hoped to discover the Northwest Passage. Crossing Lake Winnebago, he entered Fox River, and was within easy reach of the Wisconsin River and hence the Mississippi when for reasons unknown he turned back. In 1835 he was back at Quebec, then took up residence at Three Rivers as trading agent and interpreter. The friendly relations which he had established with the Winnebago and other western tribes helped to divert the Northwest fur trade to the Nipissing-Ottawa route, and was of assistance in giving a monopoly of that trade to the French for many years. He died in 1642.

**NICOLLS, RICHARD** (1624-72), English colonial governor and soldier, was born at Ampthill, Bedfordshire, in 1624. After the Restoration of 1660 he returned to England joining the household of the Duke of York. In 1664, the latter sent Nicolls with a troop of 300 soldiers to America to take over New Amsterdam, title to which had been granted the duke by Charles II. The Dutch readily submitted to Nicolls, who changed the name of the city to New York, and became first British governor. He promulgated the Duke's laws, the first legal code for the province of New York. In 1667 he returned to England. He was killed in a naval encounter against the Dutch off the Suffolk coast, on May 28, 1672.

**NICOTIANA**, a genus of narcotic-poisonous herbs and shrubs of the nightshade family including the tobacco and several beautiful garden ornamentals.



FROM JEPSON, MAN. FL. PLANTS CALIF., COPYRIGHT

**WILD TOBACCO**

(*Nicotiana glauca*). Used as smoking tobacco by the Indians of California and Arizona. Section of corolla, flowering branchlet and leaf

There are about 50 species, natives chiefly of Central and South America. They embrace both annuals and perennials bearing strong-scented, often sticky-hairy leaves and large, usually trumpet-shaped, fragrant flowers, commonly opening at night. The species grown in gardens embrace many varieties and hybrids with white, purple or yellow flowers. About 10 species grow wild in the western United States.

**NICOTINE**, an alkaloid of tobacco. Its most important application in pure form is as an INSECTICIDE; as a drug it is used to a slight extent in the treatment of tetanus. Pure nicotine,  $C_{10}H_{14}N_2$ , is a colorless poisonous liquid having an irritating odor. Tobacco contains from about 2 to 8 per cent nicotine depending on the variety. Coarse tobaccos contain a relatively large amount of nicotine while some of the finer varieties such as Turkish tobacco contain hardly any. Only an extremely small amount of the drug is present in the smoke.

**NICTHEROY**, a city of Brazil and capital of the state of Rio de Janeiro situated on the eastern side of the bay. Beautifully located, it is a suburb of villas reached by boat from Rio de Janeiro, possessing handsome public buildings and wide streets. Textiles, tobacco, sugar and spiritous liquors are manufactured here. Pop. 1920, 86,238; est. pop. 1930, 108,233.

**NIDAROS.** See TRONDHEIM.

**NIDIFICATION**, the preparation and supervision of a nest for the reception of eggs or young. The instinct and practice of nidification is most marked among birds, but occurs also in some mammals, fishes, amphibians and invertebrates (see NEST). In nidification, the choice of a site is of primary importance, many birds camouflaging their nests with amazing skill. The purpose of building nests away from the ground may have originally been to protect eggs and the incubating parent bird from cold, damp and predatory enemies.

Though most birds take some precautions to protect their eggs, not all make nests. Parrots, like woodpeckers, lay their eggs in hollow trees. Birds of warm, sandy wastes often lay theirs carelessly in scooped out hollows on the ground, and megapodid birds prepare mounds of decaying vegetation, leaving the eggs to hatch by natural heat.

Although the female usually incubates the eggs, in some species both parents take their turns at the nest. Sometimes a new nest is built each year; others, like the storks, return regularly to former habitations. Skill grows with experience, young birds building better nests each season, while others tear apart and improve the first efforts. The importance of nidification in the life cycle of the bird is shown by the success of ready-built birdhouses which have encouraged birds of even the very shy species to return year after year to nesting places once found satisfactory.

G. E. F.

**NIEBUHR, BARTHOLD GEORG** (1776-1831), German historian, philologist and statesman, was born at Copenhagen, Aug. 27, 1776. He studied at the University of Kiel. From 1806 to 1810 he held various positions in the Prussian civil service. In 1810 he was appointed lecturer and royal biographer in the University of Berlin. He was ambassador to Rome from 1816 to 1823 when he returned to become a professor at the University of Bonn. His *Romische Geschichte*, 3 vols. 1811-32, revolutionized the study of Roman history. He died at Bonn, Prussia, Jan. 2, 1831.

**NIEHAUS, CHARLES HENRY** (1855- ), American sculptor, was born at Cincinnati, O., Jan. 24, 1855. He studied at the Royal Academy, Munich. After further study in Rome, he opened a studio in New York. He became a member of the National Academy in 1906. His works include the Garfield statue, Cincinnati; the Hahnemann Memorial, Washington; statues in the Congressional Library; Astor historical doors, Trinity Church, New York; figures in the Capitol rotunda, Washington; Beardsley Monument, Bridgeport, Conn.; and the Soldiers' and Sailors'

memorials, at Hoboken, Newark and Hackensack, N.J.

**NIEMCEWICZ, JULIAN URSIN** (1757-1841), Polish poet, historian and statesman, was born in Lithuania in 1757. He was exiled, went to America and there married Mrs. Livingston Kean of New York. Upon his return to Poland, he became Secretary of State and acted as president of the constitutional committee. He was again exiled after the insurrection of 1831, and lived in Paris until his death. Niemcewicz was a versatile writer and translator, and his works include ballads, novels, satirical comedies, tragedies, didactic poems, political treatises, historical works and personal memoirs. Especially prominent are *The Return of the Deputy*, 1790, a political satire of a high order, *John of Tenczyn*, 1825, a famous historical romance, *History of Sigismund III*, 1819; and *Ancient History of Poland*, 1823. The work, however, that enjoys the most lasting popularity is his *Lays of Polish History*, 1816, which is studied in Polish schools. Niemcewicz died in Paris, Apr. 21, 1841.

**NIEMEN**, important river of central Europe. Rising in White Russia, near Minsk, the stream flows generally west across Poland to the city of Grodno, where navigation commences; from there it twists north into Lithuania, and, reaching Kovno, turns west to form the border between Lithuania and Germany. Then it debouches beyond the German city of Tilsit into the Kurisches Haff, a large lagoon practically cut off from the Baltic Sea by a narrow tongue of land. The river is called the Memel in its lower portion. Over 550 mi. long, the Niemen is navigable for four-fifths of its course, and forms a valuable waterway for the transportation of wheat and lumber from the interior. Frequent inundations occur in the springtime along its generally low, marshy banks. The Viluja and Szezippe are its largest affluents.

**NIETZSCHE, FRIEDRICH** (1844-1900), German philosopher, was born at Roken in Saxony, Oct. 15, 1844. He came from a family of ministers and was educated for the ministry. Perhaps this helps to account for his later revolt against Christianity. Nietzsche became professor of philology at Basel in 1869, which position he held for 10 years when he was forced to give it up on account of a growing illness he had contracted during the Franco-Prussian war. Ten years later he suffered a complete mental breakdown and was insane for the rest of his life. He died at Weimar, Aug. 25, 1900.

Nietzsche was a voluminous writer. His first work to attract attention was *The Birth of Tragedy*, 1870-71. Other works for which he is famous are: *Human All—Too Human*, 1878; *Thus Spake Zarathustra*, 1882; *Beyond Good and Evil*, 1885-86; *Genealogy of Morals*, 1887; *The Will to Power* and *Anti-Christ*, 1888.

Nietzsche was the great arch enemy of Christianity. To him it represented a slave ethics, and he much preferred those of Zarathustra, his mighty superman. An exponent of class morality, he believed in culti-

vating the virtues of the ruling class rather than those of their slaves. He failed to recognize the strength of cooperation and he judged Christianity more by its roots than by its fruits. Nevertheless he sounded a note that has to be reckoned with, and despite the one-sided emphasis, it is a good antidote for conventional teachings.

**NIEUPOORT**, a town of Belgium, situated on the Yser, in West Flanders, 2 mi. from Nieuport Bains, a fashionable bathing resort and 10 mi. south of OSTEND. The town is noted as the place where Maurice of Nassau vanquished the Spaniards in 1600 at the Battle of the Dunes. During the World War Nieuport was destroyed but has since been completely rebuilt. The inhabitants engage in fishing, and rope and net making. Pop. about 3,000.

**NIEVO, IPPOLITO** (1832-61), Italian novelist and dramatist, was born in Padua, Nov. 1832. His most famous work, *Confessions of an Octogenarian*, 1857-58, is a historical novel ranked with Manzoni's *I Promessi Sposi*, and depicting Italy in the last years of the 18th century. Nievo served under Garibaldi in 1856 and was shipwrecked and drowned in returning from Garibaldi's expedition to Sicily, Mar. 4, 1861.

**NIGER**, the third largest river of Africa. It rises in the highlands of Futa Jallon near Tembi-kunda on the borders of Sierra Leone and French Guinea, and flows for about 2,600 mi. chiefly in an easterly direction to the Gulf of Guinea. It drains an area, including that of the Benue river, estimated at 1,023,280 sq. mi. The upper sections are divided into three main branches which unite to form one river above Siguri.

The Niger consists of practically three different rivers: two are tropical in character, and the intermediate section is mainly a desert stream. The tropical rains of Futa Jallon form the upper Niger, which expands below Bamako and covers the plains during the rainy season so as to form innumerable lakes and marshes which are quickly reduced in size by evaporation. This section then covers a great plain where the fall is only about 1 ft. every 10 mi. From the source of the river to Bamako, a distance of 375 mi., the river falls from 2,800 to 800 ft., and is navigable between Kurussa and Bamako, below which navigation is stopped by a barrier of rocks. But it is resumed below Kulikoro, whence boats run to Kabara, the port of Timbuktu, and continue to An-songo, 870 mi. below Kulikoro. Under favorable circumstances navigation is open as far as Niamey. Below Niamey there are numerous rapids as far as Gaya, near the borders of Nigeria, which render navigation extremely difficult. The first section of the river runs northeast to the neighborhood of Timbuktu, where it may be said to terminate. The Niger receives no important tributaries on the northern side, but is fed by the important Bani, or Bangoe, which rises in the Keneduga highlands and for some distance runs almost parallel with the Niger before joining it on its southern side. Below Timbuktu the

second or desert section flows through sandy country without rain and affluents, and struggles for existence; but near Say it enters the region of tropical rains and continues in a southeasterly direction, having turned in this direction at Burem, where the river forces its way through the rocky gorges of Tossaye. Geological evidence shows that the whole of this region covering the great bend of the Niger once formed a vast inland sea.

South of Gaya as far as Sakachi, the river is again navigable. Between Gaya and Jebba over a section of 120 mi. there are numerous rapids, including the Bussa Falls, where Mungo Park, the first European to explore the Niger, lost his life. Navigation on the lower sections of the river is difficult, and the estuary with its numerous mouths requires frequent dredging.

**NIGER COLONY**, one of the colonies of FRENCH WEST AFRICA, bounded on the north by Algerian Sahara, south by Nigeria, east by French Equatorial Africa and west by Upper Volta and the Sudan. Estimated area 463,200 sq. mi. The southern zone is inhabited chiefly by Hausa, who keep many cattle and cultivate such typical savanna crops as millet, maize, rice, wheat, peanuts, tobacco and cotton. The district to the north is desolate country but in the central section wooded areas appear.

Niger Colony has Niamey as its capital. Zinder, the only town of importance, still maintains a certain amount of caravan trade. In 1926 two districts of Upper Volta were transferred to the colony and added 119,946 inhabitants. Pop. 1929, 1,473,601 including 349 Europeans.

**NIGERIA**, a British colony and protectorate on the west coast of Africa at the head of the Gulf of Guinea. Area approximately 372,000 sq. mi., comprising a number of districts formerly under native kings and trading companies. This is the most densely peopled political division in Africa. In the south are pure Negro tribes, of whom the Yoruba are especially important. The Fulani and Hausa of the north show considerable Hamitic admixture. The Fulani are still largely nomadic, the Hausa are traders and cultivators. The Yoruba have a relatively advanced culture. In the forest belt are many pagan tribes.

Dense mangrove swamps yield tannin, bark and logs. The forests contain mahogany, ebony, oil-palms, rubber and gum copals. There is evidence of progressive encroachment of the desert upon the savanna zone in the north. Nigeria produces palm oil, palm kernels, coco, cotton, hides and skins. There are many cattle, sheep and goats. Mineral wealth is primarily in coal and tin. Limestone is widely distributed, and salt is obtained, chiefly from brine springs and ponds.

Lagos has the bulk of trade and shipping. Calabar, Forcados, Bonny and Victoria are other ports. Inland are a number of large towns. Ibadan, the largest city of tropical Africa, is a native center of 150,000 inhabitants. Kano is surrounded by an extensive irri-



gated area. The Niger River, 2,600 mi. long, has several navigable sections.

In 1900 the two protectorates of Northern and Southern Nigeria were formed. Lagos was bought from a native king in 1861, and in 1914 was named the capital of Nigeria. The population in 1931 amounted to 20,762,083.

**NIGHTHAWK**, a genus (*Chordeiles*) of small nocturnal birds allied to the whippoorwills, found practically throughout the New World. There are about 12 forms, all about 9 or 10 in. long, with very wide mouths, long narrow wings and soft plumage mottled with blackish, grayish and dusky above and barred whitish or buffy below, with a conspicuous



COMMON NIGHTHAWK

white patch on the wing. The best known species is the common nighthawk (*C. minor minor*), found chiefly in eastern North America and wintering southward to eastern South America. It is swift, noiseless and very graceful in flight, feeding entirely upon insects, which it captures on the wing. The two blotched and speckled eggs are laid on the bare ground or on flat gravel roofs. The name is sometimes applied to the nightjar of Europe and others of the goatsuckers (*Caprimulgidae*).

**NIGHT HUNTING**, a form of sport now illegal in most of the United States and in Canada. Jacking for deer was once a common method of hunting; but the deer, blinded by powerful lights suddenly thrown on them, had so little chance to escape that sportsmen universally condemned the practice. Tigers are hunted in India and Malaysia at night, the hunters being concealed in blinds usually placed in nearby trees. Live kids or other small animals are used as decoys. In Somaliland, lions are shot at night from inside a *zareba* of thorn bushes.

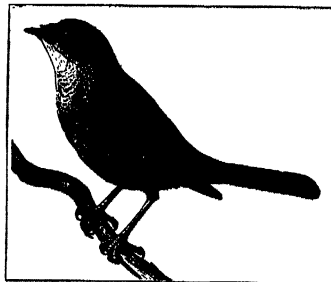
Night hunting in the United States is now almost entirely confined to the pursuit of raccoon and opossum, both animals being "treed" with dogs.

See Mellis, *Lion Hunting in Somaliland*.

**NIGHTINGALE, FLORENCE** (1820-1910), English nurse, was born at Florence, Italy, May 12, 1820. She was educated at home, became interested in hospitals through her mother, and took several nursing courses. In 1853 she became superintendent of a London hospital. Her real career began, however, when Sidney Herbert, British Secretary of War, sent her to the Crimea in 1854, with 38 nurses. Conditions in the hospitals there were appalling, but despite almost insurmountable difficulties, Miss Nightingale greatly reduced the rate of mortality. After her return to England a fund of £50,000 was raised for the

Nightingale Home for training nurses of St. Thomas's Hospital. Miss Nightingale founded the Institute for Nursing, continued to agitate for reform and wrote several books on nursing and sanitation. Her work has become a symbol of noble achievement. She died at London, Aug. 20, 1910.

**NIGHTINGALE** (*Luscinia megarhynca*), a famous Old World songbird of the thrush family allied to the English robin redbreast. It is about 6 in. long, of a uniform brown tinged with reddish above, and grayish white below. In summer it is widespread in western and central Europe, retiring



EUROPEAN NIGHTINGALE

southward in winter to Africa. It is shy in disposition making its home in woods, groves, thickets or hedges, where it secures its insect food mainly on the ground. The nest, in which are laid 4 to 6 deep olive-brown eggs, is a loose structure of grasses, leaves and rootlets placed on or near the ground. The loud, rich, varied song of the nightingale, which has been celebrated by poets from earliest times, is uttered in spring by the male from the time of mating until the young have been hatched; in England from about April 15 to June 15. It is usually heard in the evening, continuing on fine moonlight nights till nearly midnight.

**NIGHTSHADE**, a name commonly given to various species of *Solanum*, a numerous genus of the nightshade family. The bittersweet nightshade (*S. Dulcamara*) is a straggling or climbing, somewhat woody perennial bearing dark green, more or less lobed leaves and branching clusters of drooping blue, purple or white flowers. The showy red fruit, an oval or globular berry, is reputed poisonous. A native of temperate Asia and Europe, the plant has spread by naturalization very widely throughout eastern North America. The black nightshade (*S. nigrum*), a spreading annual about a foot high, has become distributed as a weed in every part of the world except the extreme North and South. The plant bears oblong coarsely toothed leaves, small white flowers in contracted umbel-like clusters and globular black berries, usually regarded as poisonous. See also SOLANUM.

**NIHILISTS**. The term was first coined in the '60's of the last century by the Russian novelist Ivan S. Turgenev to apply to a contemporary school of thought typified by the essayist D. I. Pisarev, who

advocated a revolutionary emancipation from all authority, and convention in both politics and literature. With this theory as a starting-point, many younger liberals, especially among Russian students, drew the conclusion that the whole existing scheme of government, morals, and religion could be scrapped without loss. Pisarev's theory had been primarily egoistic. In the '70's, this egoism gave place to the populist movement with its emphasis upon service to the peasantry. During the same decade, the young radicals became divided between populist theory and the anarchistic creed preached by Michael Bakhtunin. The liberal groups then formed included most of the great revolutionary names of the early 20th century, among them N. Chaikovski and K. Breshkovskaya. The acts of rebellion initiated by the extreme insurrectionist party inspired official measures of repression which hit the more moderate populists with equal rigor. Held in abeyance by the patriotic enthusiasm which accompanied the Turkish War, the revolutionary movement broke out once more with renewed violence after the Treaty of Berlin. Terrorism became a recognized weapon of protest. In 1878, Vera Zasulich shot General Trepov. The extremists of the *Narodnaya Volya* (National Freedom) group directed their attacks against the Tsar himself, and Alexander II fell a victim to a terrorist bomb on Mar. 13, 1881. The conservative and repressive policy of the next two reigns stimulated and strengthened revolutionary parties of all shades. By 1900, an active Socialist Party was already formed under the leadership of Plekhanov and Lenin, and the disillusion brought on by the fiasco of the Russo-Japanese War spurred the radical partisans of violence to new deeds of terrorism which heralded the revolution of 1905. Outside Russia, the term *nihilist*, originally a purely social and literary concept, was synonymous with the terrorists of extreme revolutionary conviction.

S. H. C.

**NIKE OF SAMOTHRACE.** See WINGED VICTORY OF SAMOTHRACE.

**NIKISCH, ARTHUR** (1855-1922), Hungarian conductor, was born at Miklos, Oct. 12, 1855. He began musical studies at the age of six, and at seven wrote down from memory the Tell and Barbiere piano overtures, after hearing them for the first time on an orchestration. In 1889 he was appointed director of the Leipzig Opera, in 1895 conductor of the Boston Symphony Orchestra, and in 1905-06 served as conductor of the Leipzig Gewandhaus Orchestra. He was one of the greatest of modern conductors. Nikisch died at Leipzig, Jan. 23, 1922.

**NIKKO**, a district in Japan, although the name usually is applied to the principal town in the district. The place, which is located some 90 mi. north of Tokyo, has been a religious center for many centuries. It attained special prominence when the first Tokugawa shogun, Iyeyasu, was buried there with great pomp in 1617. His grandson, Iyemitsu, third Tokugawa shogun and almost as great an administrator as Iyeyasu, was killed at Nikko when he went

there to visit his grandfather's tomb in 1650. From 1644 to the end of the Tokugawa shogunate in 1868 the abbots of Nikko were always princes of the blood royal. Thirteen of the abbots are buried there. A long double row of cryptomeria trees leads up to Nikko, and the mausolea and temple grounds contain many beautiful trees. The region is visited by many tourists.

**NIKOLAEV**, a port city on the Black Sea in the southern part of the Ukraine S.S.R. It is located at the junction of the Bug and Ingul rivers, with a naval and commercial harbor and good rail connections. Established by Count Potemkin in 1789, Nikolaev grew into a leading naval port and shipbuilding city. The principal exports are grain, iron, manganese, sugar and lumber; the town is equipped with floating and railroad grain elevators. Industrially important are well-developed machine-building factories; other local products are shoes, tobacco and glass. Among its institutions are four museums and an aquarium. Pop. 1926, 104,909.

**NILE**, the longest river in Africa, and second in length to the longest river in the world, the Mississippi-Missouri. From the outlet at Lake Victoria Nyanza to the Mediterranean Sea the Nile is 3,473 mi. long. It drains an area of more than 1,000,000 sq. mi. from the Kagera source to the Mediterranean. Lake Victoria Nyanza is situated on the equator, in the northern part of the lake plateau, and into it the Kagera and minor streams flow. The lake is at a height of 3,700 ft. A rapid descent, including the Ripon Falls, brings the Victoria Nile to Lake Kioga, and an even more abrupt descent, including the Murchison Falls, carries it to the north of Lake Albert Nyanza where it receives the waters of the western branch of the Great Rift Valley, at the head of which lies Lake Albert, draining Lake Edward Nyanza and Mount Ruwenzori by the Semliki River. The combined waters form the Albert Nile, or *Bahr-el-Jebel*; the modern Egyptians call the river *El-Bahr*, "the sea." The valley widens towards the north. The steep banks of the gorge at Dufle ("defile") are an exception. At Gondokoro, at a height of about 1,500 ft., the river begins a meandering and swampy passage through the Sudan. At Lake No the *Bahr-el-Ghazal* with its swamps joins the main stream, having combined the drainage of the *Bahr-el-Arab* and numerous other streams that discharge water from the wet plateau area separating the Nile and Congo basins. At the confluence with the Bahr-el-Ghazal the main stream takes the name of the White Nile.

It is along the Bahr-el-Jebel and the Bahr-el-Ghazal that the well-known accumulations of sudd (= "block") develop. In marshes, lagoons and backwaters, papyrus, reeds and other water plants flourish. This vegetation encroaches upon the river itself and often completely hides the channel. In such circumstances navigation is maintained only by clearing it away, a tedious operation involving the finding of the river-bed, the burning of the top vegetation, and the cutting of the sudd into blocks, which are for-

cibly removed by a steamer. It seems probable that the whole sudd region, extending eastward into Abyssinia, was once an inland lake which has been filled with alluvium by the annual flood of centuries. In the Bahr-el-Ghazal region are vast areas of alluvial flats which are alternately open grassland in the dry season and covered by shallow water in the wet.

**Important Tributaries.** Below Lake No there are no significant left-bank tributaries, but on the right bank enter the Sobat, Blue Nile and Atbara, tributaries of vital importance to the White Nile. They come from the Abyssinian plateau, mainly over 6,000 ft. in height, and with areas of more than 10,000 sq. ft., consisting of enormous lava flows superimposed upon Archæan rocks. The Blue Nile, rising in Lake Tana and with a length of about 850 mi., is the most important of these tributaries, and between its mouth and that of the Atbara occurs the first (called the sixth) cataract; the "first" or lowest cataract is just above Assuan. Below Albara no permanent stream reaches the Nile, although half its course is still to be run.

**In Egypt.** Before entering Egypt the Nile makes a great bend to the west through the arid region of the Nubian desert, and from Wadi Halfa, the frontier station of Egypt, it runs again generally northward to the Mediterranean. Between Khartoum and Assuan, about 24° N. lat., the Nile is much impeded by numerous rapids and cataracts, and at these points occur the chief towns outside the delta region. As the Nile approaches the sea it forms the huge delta before emptying into the Mediterranean through two mouths.

The irrigation system traverses the whole delta with canals of all sizes, into which, during some of the summer months, the whole of the water of the Nile is diverted, leaving none to flow down its two natural channels. These waterways are named after towns near their mouths: Damietta on the eastern branch, Rosetta on the western. In pre-dynastic times the delta was smaller, probably forming the bottom of a wide bay, into which it has gradually been extended by continual deposition of silt at its mouth. After the past twenty centuries it would seem to have reached the limit of natural extension seawards, as the curved projection which it makes into the Mediterranean is prevented from developing further by the sea currents which sweep the flood silt away to the east.

**Irrigation.** The Nile irrigates about 5,400,000 acres; this area may be increased by engineering improvements. Egypt has been called the "gift of the Nile," and irrigation of a sort has been practised here for at least 7,000 years. It depended of old upon the supply of flood water, and was distinctly limited in scope. Modern engineering has greatly added to the economic development of both Egypt and the Sudan. A practically rainless climate restricts agriculture in Egypt to the districts to which water can be carried: a narrow strip above Cairo sometimes not much more than a mile in width on both sides of the

Nile; and below Cairo, the fan-like delta of the river. The annual flooding of the Nile occurs in the hottest months of the year, when the tropical rains which have fallen on the highlands of Abyssinia descend the Blue Nile and Atbara, and attain their maximum about the middle of September. At a slightly later date, the floods of the Blue Nile are met at Khartoum by those descending the White Nile, which have been caused by the rains on the Mufumbiro and Ruwenzori mountains, but these late floods are not so important as the Abyssinian. At Assuan, where the Nile breaks over a rocky barrier, a great dam has been erected. Here the waters are allowed to escape when the river becomes low. Other barriers have been built to distribute the water locally rather than to regulate the flow of the river. In 1929 the Egyptian government decided to complete the barrage begun some years previously at Gibel Aulia, about 30 mi. south of Khartoum, in order to serve Egypt in the early months of the year. The extension of the Gezira plain area, which lies at the angle made by the White and Blue Niles and which is irrigated from the Sennar Dam at Makwar in the Sudan, is contingent upon agreement with Egypt, for obviously unregulated control of the Blue Nile has serious effect upon the cultivation of the country. The Sudan government has guaranteed to Egypt the use of all the White Nile water.

**Flow of the Nile.** In the early part of the year the rainfall of the Nile basin is at a minimum, and more than half the supply of water to the Lower Nile comes from the lake plateau. For several reasons the discharge at Lake No varies only slightly during the year. The loss of water in the upper part of the Nile basin is so great that it has been estimated that only 0.1% of the rainfall of the basin above Lake No is discharged at that point. Lower down the Bahr-el-Jebel and along the Bahr-el-Ghazal the accumulations of sudd spread the water out in shallow swamps, and this mass of vegetation contributes in producing a tremendous loss of water by evaporation; the result is the very small discharge at Lake No, although this discharge is the chief winter supply of water to the lower river. The Sobat brings down monsoon rain from Abyssinia, where the summer rainfall is supplemented by melted snow, and its discharge produces a rise of 10-12 ft. between its junction with the White Nile and Khartoum. The Blue Nile discharge is the most important in the Nile flood. In August, September and October it provides about two-thirds of the water of the Nile. At Khartoum the river rises sharply at the end of May and reaches its maximum early in September, after which the fall is rapid. The rise at this point averages 22 ft.; and the White Nile is ponded up by a flood discharge that at its maximum is some 15 times greater than that of the main river itself. This damming-up prevents the White Nile from having more than a slight effect in producing the flood lower down, but at the same time helps to retard the fall in the Nile below Khartoum after the Blue Nile has

passed its maximum. Yet when the Nile is lowest, in April and May, 85% of its water is from the White Nile. The Blue Nile also brings down the bulk of the silt that is deposited in Egypt, for the Atbara lower down makes only a minor contribution and its discharge is only a summer one, whereas the Blue Nile is able to maintain a small winter flow, being regulated by Lake Tana at its source. At Wadi Halfa the river continues falling until the middle of June, as it takes time for the flood water to pass down the river. It rises rapidly until the middle of September, and then falls equally quickly, although there is still a considerable flow at the end of the year. The maximum at Cairo occurs in October. All through its middle and lower track the Nile suffers great loss by seepage, evaporation and irrigation, with the result that the amount of water it sends into the Mediterranean Sea, almost entirely by the Rosetta and Damietta mouths, is very small. In fact, when the Nile is at its lowest these mouths have to be artificially dammed to prevent an inflow from the sea.

**Navigation.** The sudd of the Bahr-el-Jebel section, the six cataracts of the middle course and the periodical low water in the lower course are all hindrances to navigation. Nevertheless, there is a good deal of local traffic, by canoe in the Sudan and small sailing-craft in Egypt. Government steamers progress as far up as Rejaf in the southern Sudan. The cataracts are at Assuan, above Wadi Halfa, at Kerma, below Dongola, at Kareima, below Berber, and below Khartoum. Altogether there are about 3,000 mi. of navigable waterways on the Nile and its tributaries.

**Discovery.** In 1770 the source of the Blue Nile was discovered in the highlands of Abyssinia by James Bruce, while the source of the Victoria Nile, or true Nile, was for many years the subject of speculation and exploration. However, the discoveries in 1861-62 of Speke and Grant, of Baker in 1864 and of subsequent explorers, have established the fact that the headwaters of the Nile are collected by Lake Victoria.

**NILE, BATTLE OF THE,** Aug. 1, 1798, an engagement fought in Aboukir Bay near Alexandria, during the French invasion of Egypt, between the English navy, commanded by Admiral Nelson, and the French under Admiral de Brueys. In his efforts to prevent an attack from the land side and to force the two navies to meet in a frontal clash, the French admiral anchored his ships in the bay. Nelson immediately saw his advantage. Leaving part of his fleet to attack from the seaward side, he directed the remainder to break through the southern side between the shore and the enemy ships. His plans were successful, most of the French fleet being either captured or sunk.

**NILES,** a city of Berrien Co., southwestern Michigan, situated on the St. Joseph River about 93 mi. east of Chicago. It is served by two railroads and by interurban and bus lines and has a municipal airport. It is a trading and shipping center for a prosperous agricultural region, has a large mushroom industry, and several local manufactures. In 1929 retail

trade reached a total of \$7,115,993. On or near the site of Niles, in 1690, French Jesuits established a mission, the present city being established in 1829 and incorporated in 1859. Pop. 1920, 7,311; 1930, 11,326.

**NILES,** a city in Trumbull Co., northeastern Ohio, situated on the Mahoning River, 8 mi. northwest of Youngstown; it is served by three railroads. With a manufactured output worth about \$31,000,000 in 1929, Niles is of industrial importance. The chief products are steel, glass and firebrick. During 1929 the retail trade amounted to \$6,315,619. Dairying is the leading agricultural interest. Niles was founded in 1832; the village was incorporated in 1895 and became a city in 1895. President William McKinley was born here. Pop. 1920, 13,080; 1930, 16,314.

**NILES CENTER,** a suburban residential village in Cook Co., northeastern Illinois, situated 10 mi. northwest of Chicago. It is served by the Chicago and Northwestern Railroad, an elevated electric line and bus lines. Niles Center is predominantly a residential community for Chicago business men, having no industries of importance. Pop. 1920, 763; 1930, 5,007.

**NILGAI** (*Boselaphus tragocamelus*), the largest antelope found in India, somewhat resembling the eland and kudu of Africa. The main difference in appearance proceeds from the long beard on the throat and the black mane on the elevated shoulders. The short horns, never more than 8 in. long and present only in the male, are black, smooth and conical, and but slightly curved forward. The general body coloring is brownish-gray, with white markings on face and feet. The nilgai stands 4½ ft. at the shoulders. The head and body somewhat resemble those of a domestic ox. The limbs, however, are longer and slimmer, and the nilgai is a fleet, active animal, which does with little water. It keeps to the bushy plains, feeding and browsing by day. In districts where it is not hunted the nilgai is easily approached, but is timid and cautious when annoyed, though it can be tamed.

**NILOTIC,** in anthropology. See RACES OF MANKIND: *Negroid Group*.

**NÎMES,** a city of Languedoc and the capital of the department of the Gard, in Roman remains the richest in France. The Romans settled here about 120 B.C. building a city favored by the emperors. Medieval Nîmes became a center for southern Protestantism and suffered greatly from the religious wars and the revocation of the Edict of Nantes. To-day it is a thriving industrial and mercantile town, manufacturing textiles and trading in wines and foodstuffs. The most famous monument of Nîmes is the *Maison Carrée*, built by Agrippa, one of the finest and best preserved Roman temples in existence, as well as one of the most beautiful classic buildings north of the Alps. The Amphitheater, Temple of Diana, Fountain, and Tour Magne, the last-named being the oldest building in Nîmes, are all noteworthy ancient structures. Nîmes is also the center for visits to Agrippa's

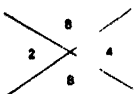
famous aqueduct, the Pont du Gard. Pop. 1931, 89,213.

**NIMROD**, the mighty hunter of the Biblical narrative in Genesis, the first great ruler and builder of cities. The cities he is said to have built include Babel and Nineveh, a tradition preserving the historical fact that the Babylonian was built before the Assyrian city. Nimrod has been identified with the Babylonian god Merodach, but other authorities hold that the name is of Egyptian origin. As possible as any etymology is that which connects the name Nimrod with a Hebrew or Syriac root-word signifying "rebel." The word "Nimrod" is found to-day preserved in the names of many places in western Asia.

**NINEBARK** (*Physocarpus opulifolius*), a spirea-like shrub of the rose family native to rocky woods and stream banks in eastern North America and commonly planted for ornament. It grows from 3 to 10 ft. high with wide-recurving stems, bark peeling in strips, and three-lobed leaves. The small white flowers, borne in dense clusters about midsummer, are followed in autumn by showy reddish pods.

**NINE POWER TREATY**, called also Treaty of Chinese Integrity, an agreement devised at the WASHINGTON CONFERENCE, and signed Feb. 6, 1922 by plenipotentiaries of China, the United States, Great Britain, France, Italy, Japan, Belgium, the Netherlands and Portugal. The signatories were pledged to fundamental principles for the maintenance of peace in the Far East on the basis of mutual international aid; respect of the territorial integrity and political and administrative independence of the Chinese Republic; equal commercial opportunity in China for all nations; observation of China's rights as a neutral in future wars; abstention from any effort to secure special privileges which would contravene the rights of other countries. The same signatories on the same day entered into a treaty pertaining to the Chinese tariff, whereby China was enabled to increase its customs revenue materially.

**NINES, CASTING OUT**, an expression used in connection with a certain valuable check used chiefly in multiplication. It depends upon the fact that the remainder arising from dividing a number by 9 is the same as that found by dividing the sum of its digits by 9. To find this remainder we need merely to add the digits, casting away each 9 as it occurs. For example, to find this remainder in the case of 782,304 begin at either end, say at the left; then observe that  $7 + 8 = 15$ , and cast out the 9, leaving 6; then  $6 + 2 + 3 = 11$ , or 2 when the 9 is cast out; then  $2 + 4 = 6$ , which is the remainder, or excess of 9's, in dividing 782,304 by 9. In the multiplication of 274 by 38, for example, if the product is found to be 10,412, we check this result by writing the excess in 274, which is 4, at the right in the above figure; the excess in 38, which is 2, at the left. We then write the excess in  $2 \times 4$  above, and the excess in 10,412, which is 8, below. If the upper and lower numbers in the cross, 8 in this case,



agree, the result is probably correct. The check fails in the rare cases of putting in an extra 0 or 9, or of transposing any figures in the result.

**NINE SPHERES, THE**, in the early Ptolemaic system of astronomy, the crystalline spheres in which were fixed the Sun, Moon, Mercury, Venus, Mars, Jupiter and Saturn, the Crystalline Sphere and the Sphere of the Fixed Stars. The *Primum Mobile*, added later, was the tenth sphere. Milton, in his *Arcades*, speaks of the "nine enfolded spheres." In revolving each was supposed to give out a tone, and so produced the "music of the spheres."

**NINEVEH**, the ancient capital of the Assyrian Empire, was situated on the shore of the River Tigris, with the Khosr on the northwest, the Gomal on the northeast, and the Upper Zab on the southeast. The city was built on two mounds and Sumerians were known to occupy the region, although the date of the founding of the city is not certain. It is thought to have been built by Nimrod. Nineveh did not come into importance, however, until the reign of Sennacherib, who erected a fine palace, established an arsenal, laid out roads and a park for hunting and improved the water supply. Assur-bani-pal further beautified Nineveh, building a palace in which he collected a famous library of Babylonian literature. After the fall of Babylon, Nineveh was the most splendid city of the east. It was destroyed by the Medes in 612 B.C. The modern city of Mosul is opposite the site.

**NINE WORTHIES**, the nine greatest heroes of antiquity and romance, selected somewhat arbitrarily. Mentioned in the preface to *MORTE D'ARTHUR*, they comprise the following names of famous personages: Joshua, David, and Judas Maccabaeus from the Bible; Hector (son of Priam), Alexander the Great and Julius Caesar from the classics; and King Arthur, Charlemagne, and Godfrey of Bouillon (or, sometimes, Guy of Warwick) from romance. The Nine Worthies are parodied in Shakespeare's *Love's Labour's Lost*.

**NINGPO**, a treaty port of China, in the central province of Chekiang. Translated Peaceful Waves, Ningpo rises on the River Yung near its mouth on the East China Sea. The port stands out in Chinese history as the earliest known place where foreign colonists settled. Furniture manufacturing is its most important industry. Products and exports include rush hats and mats, green tea, cotton and fish preserved on ice.

The Treaty of Nanking opened Ningpo to trade in 1842. Foreign relations had already had a history of more than 300 years there. The city is believed to have been founded 2205 B.C. and moved to its present location 713 A.D. After visits by Portuguese explorers, Ningpo in 1533 had a flourishing foreign colony. In 1545 the Emperor attracted by reports of licentious conduct and insolence among the Colonists, ordered a massacre. Twelve thousand Christians, including 800 Portuguese, were killed. Afterwards regulations against foreign trade were severe and Ningpo was not

entered again until 1840 when British war vessels established a blockade there. The city fell in 1841. Many of the people of Ningpo have migrated to Shanghai. Pop. 1929, 212,518.

**NINIAN, ST.** (5th century), apostle of Cumberland and of the Southern Picts of Scotland, was born in the 5th century. A Briton by birth, he was educated at Rome. The records of Bede state that Ninian preached with great success in Cumberland and among the Picts of southern Scotland. The date and place of his death are obscure. St. Ninian's day is kept on Sept. 16.

**NIOBE**, in Greek mythology, daughter of TANTALUS and wife of AMPHION, King of Thebes, was mother of 14 children. In her pride of motherhood she mocked LETO who had only APOLLO and ARTEMIS. To avenge their mother these two killed all of Niobe's children with their arrows. ZEUS in pity turned Niobe into a rock which wept unceasingly.

**NIOBIUM.** See COLUMBIUM.

**NIPIGON**, a forest reserve located on the Laurentian Plateau, 80 mi. north of Lake Superior in the province of Ontario, Canada. It comprises 7,297 sq. mi. of virgin coniferous forest surrounding Lake Nipigon, area 1,769 sq. mi. including the islands, the sixth largest of the Great Lakes. Lake Nipigon and the many smaller lakes, swift-flowing rivers and streams which abound in speckled trout, whitefish, lake trout, pike, pike perch and sturgeon make this region a world-famous fishing ground. Wild life includes moose, deer, black bear, wolverines, fisher marten and beaver. Nipigon is accessible from the town of Orient Bay on the Canadian National railway where guides, canoes and other equipment may be had.

**NIPIGON, LAKE**, a body of water in Ontario, Canada, situated about 30 mi. north of Lake Superior into which it drains through the Nipigon River. The lake is 70 mi. long and 40 mi. across at its widest point, with an area of 1,450 sq. mi. Its average depth is 540 ft. It is thickly dotted with islands and surrounded by picturesque wooded country which has been set aside as a forest reserve.

**NISH**, locally Nis, a city of Serbia, YUGOSLAVIA, situated on the Nishava River, and connected by rail with Belgrade, 130 mi. to the southeast, and with Sofia and Salonika. Nish is an army headquarters and a principal military fort. The government railway repair shops are located here, and engines, trucks, passenger vehicles and iron are manufactured.

The Romans called the city Naissus. It gained renown because Constantine the Great was born here and because it was the scene of Claudius's defeat of the Goths in 269 A.D. In the 5th century Attila and the Huns demolished the city. It was rebuilt by the emperor Justinian. Later taken by the Bulgarians, Nish was held by them for two centuries until the 11th century when they relinquished the fort to the Hungarians. After a period of Byzantine rule, the city fell into the hands of the Turks and remained in their possession for three centuries. During the Russo-Turkish War, 1878, Nish was

seized by the Serbians and was assigned to them by the Congress of Berlin. Pop. 1931, 35,384.

**NISHAVA**, also Nissava, a river of Yugoslavia, chief tributary of the Southern MORAVA. It is formed by several mountain streams which have their sources in the Trin and Tsaribrod district of Bulgaria. The river follows a northwestern course through a region rich in wheat and maize and joins the Southern Morava 8 mi. west of Nish, which town is situated on its banks. Pirot, another important town, also is on its banks. The decisive battles of the Serbo-Bulgarian War of 1885 were fought in the Nishava region.

**NISKA**, one of the three dialectic divisions of the North American Indian Tsimshian, or Chimmeyan, linguistic stock. The Niska were themselves divided into two groups, the Kitkahten and the Kitanweliks. Their territory comprises Observatory Inlet, Nass Bay and the drainage of the Nass River and its tributaries in British Columbia. Like the other peoples of the Northwest Coast, the Niska lived along the shore in wooden houses in front of which were beautifully carved heraldic columns, which are now replaced entirely by modern European style houses. The river furnishes the salmon and eulachon, the principal sources of their food supply. Socially, the Niska are divided into four exogamous matrilineal phratries, each of which is further subdivided into families, each possessing a distinct crest.

**NISQUALLI**, a North American Indian tribe speaking a dialect of the Salishan linguistic stock. A small number now live on the Nisqualli Reservation on the river of the same name between Pierce and Thurston counties in Washington. The name includes also the following tribes speaking the same dialect: Puyallup, Skagit, Snohomish, Snokwalmu and Stilakwamish.

**NITER.** See SALTPETER.

**NITOE, INAZO** (1861- ), Japanese publicist and social reformer, born in Iwate-ken. He studied at Johns Hopkins University and at Bonn University in Germany and then taught in Japan, being professor of economics in the Kyoto Imperial University from 1904-11 when he became the first Japan-America exchange professor. He was for many years an ardent advocate of closer international relations, and for a time served in the League of Nations office in Geneva.

**NITON**, or radium emanation, one of the inert or RARE GASES, now generally known as RADON.

**NITRATES**, salts of nitric acid. The economically important ones are sodium, calcium, ammonium, potassium, silver, and strontium nitrates. Natural deposits of sodium nitrate were discovered on the dry pampas of Chile in the early part of the 19th century. The crude ore is purified by dissolving out the other salts and crystallising out the Chile nitrate or "salt-peter." The Shanks process using evaporation is being replaced by the Guggenheim process, using refrigeration. At present about 2,500,000 metric tons are being produced annually. Competition with synthetic nitrates has led to a complete reorganization

of the industry, the Chilean government has become a partner instead of levying an export tax as formerly. In 1885, Chile produced 75% of the world's nitrogen; in 1900, 50%, and 1929 only 25%. The principal use is as a FERTILIZER material. Calcium nitrate, used for the same purpose, is a synthetic product resulting from NITROGEN FIXATION. Ammonium nitrate is an explosive material, which, when used as a fertilizer, is mixed with chalk, calcium nitrate, or ammonium sulphate; potassium, silver, and strontium nitrates are all synthetic products which enter commerce on a much smaller scale. G. A. P.

**NITRATION**, the process embracing the formation of both organic nitrates and organic nitrocompounds. Examples of the former are glycerine trinitrate (NITROGLYCERINE) and cellulose nitrate (NITROCELLULOSE); of the latter TRINITROPHENOL (picric acid), trinitrotoluene (T.N.T.), mononitrobenzene (NITROBENZENE).

Since nitration forms water as a reaction product, the nitrating agent is a mixture of nitric and sulphuric acids, the latter being present to combine with the water formed and prevent dilution of the NITRIC ACID as nitration proceeds. Concentration of the nitrating acid mixture varies widely with the nature of the material to be nitrated. In glycerine nitration often no water is present at first; in CELLULOSE nitration twenty-one per cent or more of water may be present. In preparing organic nitrates and nitrocompounds the concentration of the nitrating acids determines the degree of nitration. A few of the industrial applications of nitration are the manufacture of picric acid, trinitrotoluene and nitroglycerine as EXPLOSIVES, nitrocellulose for smokeless powder, LACQUERS and CELLULOID, and nitrobenzene as a step in making ANILINE for dyes. E. M. S.

E. de W. S. Colver, *High Explosives*, New York.

**NITRIC ACID**, a highly corrosive liquid, formula  $\text{HNO}_3$ , that tends to destroy organic matter, and when diluted attacks most metals. When pure, it is water white, boils at  $86^\circ \text{C}$ . and freezes to a white solid which melts at  $-47^\circ \text{C}$ .

About 150,000 tons are made annually in the United States; until recently it was made by treating sodium nitrate with sulphuric acid and condensing the vapors, the by-product, acid sodium sulphate, entering commerce as *niter-cake*. At the present time, about two-thirds of the nitric acid is made by oxidizing ammonia. Approximately ten volumes of air to one volume of ammonia are passed over a heated platinum or platinum-rhodium gauze CATALYST. It is considered that the immediate product is nitric oxide ( $\text{NO}$ ), which is further oxidized by the excess air before the gas is absorbed in water. Nitric acid of 50% strength is produced at atmospheric pressure, but if pressures of about 100 pounds per square inch are employed acid of 60% strength can be obtained. Pressure plants cost much less to build. It can be brought to nearly full strength by dehydrating with sulphuric acid and then removing the nitric oxide by injecting a little steam into the acid tower.

The most important use of nitric acid is in manufacturing EXPLOSIVES. Other uses are: the manufacture of nitrates of lime and soda, NITROCELLULOSE for PLASTICS and LACQUERS, dyestuffs (see DYES, SYNTHETIC) and SULPHURIC ACID. G. A. P.

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**NITRIDING**, surface hardening of an iron-base alloy article or portion of it by heating at a suitable temperature in contact with gaseous, solid, or liquid material which supplies nitrogen in a form that will combine with the iron alloy.

The method commonly used is to heat the article to be hardened in a closed and sealed container into which a current of ammonia gas flows continually. The ammonia breaks up and the nitrogen liberated enters the steel, combining with it in such a way as to form an exceedingly hard surface layer which without further heat treatment has exceptional ability to resist wear and abrasion.

**NITRITES**, salts of nitrous acid, whose action in medicine is the dilatation of the blood vessels, are beneficial in the reduction of high blood pressure and as antispasmodics. In this group are amyl, ethyl, potassium and sodium nitrites.

**NITROBENZENE**, the simplest and most important aromatic nitrocompound,  $\text{C}_6\text{H}_5\text{NO}_2$ , made from benzene and fuming nitric acid. When purified it is an oily liquid, yellow in color, heavier than, and insoluble in water, but completely miscible with alcohol, and possessing a sweet taste and a very pleasant fragrance similar to oil of bitter almonds. Commercially it is made on a large scale, partly as an intermediate product for the manufacture of aniline and benzidine in the synthetic dye industry, partly as a perfume, and in recent years also for the preparation of the concentrated developer rodinal, or para-aminophenol.

**NITROCELLULOSE**, the nitric ester of cellulose, was discovered in 1845 by Schönbein, who applied his discovery to use in EXPLOSIVES. Hyatt's discovery of CELLULOID in 1869 added to the peace-time use of this compound. Further industrial development of nitrocellulose resulted from the production of low viscosity types which were more readily soluble in common solvents. The latter led to the production of modern LACQUERS.

In 1929 the estimated production of nitrocellulose in the United States for all purposes amounted to from fifty to sixty million pounds.

Chemically, its composition varies with the solubility desired and the use for which it is intended, the relative degrees of nitration being expressed in terms of the percentage of nitrogen in the compound. It is produced by the action of a mixture of nitric acid, sulphuric acid, and water on carefully purified CELLULOSE, the latter usually obtained from cotton linters, although some use has been made of wood cellulose.

In the manufacture, cotton linters are first dried and then charged into a mechanically agitated dipping pot



with the mixed acid. The composition of the acid is varied to control the degree or extent of nitration. The temperature is controlled to govern the viscosity of the resulting product. After stirring until nitration is completed, the spent acid is removed by centrifugal action. The nitrated product is quickly drowned in water and after washing free from the residual acid, is boiled to increase its stability. For low viscosity types a digestion with steam under pressure is necessary. The stabilized product is centrifuged to remove the excess water and finally dehydrated by displacement of the remaining water with alcohol. Approximately 30% alcohol is left in the nitrocellulose and in this form it is comparatively safe to transport and handle.

Nitrocellulose supplies a wide variety of special needs, the principal uses being as follows:

Smokeless powder types containing 12.5 to 13.2% nitrogen, for sporting and military purposes.

Regular solubility (R.S.) type containing 11.9 to 12.2% nitrogen, for lacquers, airplane dopes, artificial leather, photographic film and certain classes of dynamites.

Alcohol solubility (A.S.) type containing 11.4 to 11.7% nitrogen, for purposes similar to the R.S. type.

Celluloid type usually containing 10.85 to 11.1% nitrogen, for the production of the celluloid articles of commerce. See also PLASTICS. W. M. B.

**NITRO-COMPOUNDS**, an important class of organic substances, derived from hydrocarbons by replacing one or more hydrogen atoms by the  $\text{—NO}_2$  or nitroxyl group. Those belonging to the aliphatic series are at present only of laboratory interest; the aromatic nitro-compounds, on the other hand, form one of the steps in the manufacture of synthetic dyes, and are themselves often used as explosives. They are generally prepared from the hydrocarbons direct by the action of fuming nitric acid and the addition of strong sulphuric acid to absorb the water formed. Benzene yields only one NITROBENZENE, the more complex naphthalene and toluene two and three, respectively, the difference depending upon the location of the nitro group in the molecule. Continued treatment with nitric acid results in dinitro and trinitro-compounds, such as the well-known explosive TRINITROTOLUENE or T.N.T., and picric acid or Trinitrophenol, in both of which the three nitro-groups are placed symmetrically with respect to the fourth group present. When acted upon by reducing agents in an acid medium, nitro-compounds yield amines, such as aniline, or phenylamine, and toluidine; while, if the reduction takes place in an alkaline environment, azo- and hydrazo-compounds result, such as azobenzene, which, upon still further reduction, is converted into benzidine, a diamine. W. J. L.

**NITROGEN**, a chemical element occurring as a colorless, odorless, tasteless gas, making up 78.14% by volume of the earth's atmosphere. Inert at ordinary temperatures, it can be compressed into a liquid boiling at  $-194^\circ\text{C}$ . and frozen into a solid melting at  $-214^\circ\text{C}$ . Its chemical symbol is N; its atomic

weight, 14.01. Combined as a nitrate it is found in Chile. Proteins, occurring in plants and animals, contain 15-17% nitrogen. Nitrogen itself has limited uses, such as furnishing an inert atmosphere in electric INCANDESCENT LAMPS, or electric furnaces. Compounds with hydrogen—as in AMMONIA—and with oxygen—NITRATES—have many uses, the most important being as a plant food. G. A. P.

**NITROGEN FIXATION**, the conversion of atmospheric nitrogen into one of its compounds useful to man. This has been accomplished by three distinct processes: the electric arc, the CYANAMIDE process, and by direct SYNTHESIS. In 1913 about 32% of the fixed nitrogen was manufactured by the arc process, 58% by the cyanamide and 10% by direct synthesis as compared in 1929 with 15% of the world's production by the cyanamide and 85% by direct synthesis. This shift has been due to the differences in power requirements, which, considering the arc as unity, are  $\frac{1}{4}$  for the cyanamide, and  $\frac{1}{16}$  to  $\frac{1}{32}$  for direct synthesis.

The arc process used an electric spark to fix the atmospheric nitrogen as an oxide. The action is similar to that of lightning in a thunderstorm. In the direct synthesis, under pressure of 100-1000 atmospheres, nitrogen is fixed with hydrogen as AMMONIA. The variations of this method, such as the Haber-Bosch (German), Claude (French), Fauser (Italian), Casale (Italian) and Mont Cenis (German) differ as to pressures, temperatures, catalysts used, and other details.

The basic economic problem is a cheap source of hydrogen. The original scheme was to pass steam over red-hot iron which combined with the oxygen and set the hydrogen free. In those localities where power costs are sufficiently low, hydrogen is obtained by the ELECTROLYSIS of water. A recently built plant in the United States uses natural gas as a source of hydrogen, while in France and Belgium, coke oven gases are utilized. Large quantities of hydrogen are made by passing steam through burning coke. This WATER GAS is rich in hydrogen and can be used after impurities have been removed. Coal virtually has become the basic raw material of nitrogen fixation.

Nitrogen is obtained on a large scale by the liquefaction and fractionation of air. A cheaper method is to burn out the oxygen with hydrogen. Some of all of the nitrogen is obtained when the steam blown through a water gas set is alternated with air to rejuvenate the coke fire. Additional nitrogen can be obtained by using auxiliary producers which operate only on air and coke. Thus hydrogen manufacture can be regulated so that the proper amount of nitrogen is available in the gas which is sent to the catalyst, iron oxide and a promoter material such as potassium oxide usually being used for this purpose.

The nitrogen fixed as AMMONIA can be recovered either as *aqua ammonia* by absorbing it in water or as *anhydrous ammonia* by compressing it to a liquid. The major portion of the fixed nitrogen is not marketed in these two forms, but is converted into am-



monium sulphate, calcium nitrate, ammonium nitrate, or sodium nitrate. *See also* NITRATES. G. A. P.

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**NITROGLYCERINE**, a pale yellow, rather fluid oil, practically insoluble in water, stable indefinitely when purified sufficiently, but otherwise subject to decomposition and explosion. Contact with the skin, or inhalation of its vapors, causes violent headache and nausea. It is a dangerous poison if taken internally, although minute amounts are used in medicine. Unless mixed with related compounds, nitroglycerine freezes at 56° F. Nitroglycerine is made by running warm glycerine into a constantly stirred, concentrated mixture of nitric and sulphuric acid, allowing it to stand, running off the nitroglycerine which collects at the top, and washing with dilute alkali until neutral. *See also* EXPLOSIVES; SMOKELESS POWDER. E. M. Sy.

**NITROUS OXIDE ANESTHESIA.** *See* ANESTHESIA.

**NITTI, FRANCESCO SAVERIO** (1868- ), Italian statesman, was born at Melfi (Potenza) in Southern Italy. As a young man he studied law and became a member of the bar. Later he was appointed professor of finance at the University of Naples. In 1904 he was elected to parliament and henceforth played an active rôle in national politics. He was minister of agriculture, industry and trade during the Giolitti ministry of 1911-14 and was minister of the treasury in the Orlando cabinet of 1917-19. He became premier upon the fall of the latter government. Nitti was a firm believer in the political domination of the masses and tried to get the support of the members of the workingmen's parties—the Socialists and Catholic Popularists—by the institution of proportional representation. His ministry was generally unpopular, however, because of huge financial deficits, of his conciliatory attitude toward Yugoslavia concerning Fiume, and of the revocation of bread subsidies. He fell from power on Jan. 9, 1920. Nitti now turned his main attention to business and writing, but remained in politics, being reelected deputy in 1921. When the Fascists came to power, he opposed them. Later he left Italy to carry on anti-Fascist propaganda from Paris. Nitti is the author of several notable political and economic works, among which may be noted *L'Italia all'Alba del Secolo XX* (1901); *Peaceless Europe* (1922); *La Decadenza dell'Europa* (1923); *They Make a Desert* (1924); *Bolshevism, Fascism, and Democracy* (1927). S. B. C.

**BIBLIOGRAPHY.**—Vincenzo Nitti, *L'Opera di Nitti* (1925).

**NIXON, LEWIS** (1861- ), American shipbuilder, was born at Leesburg, Va., April 7, 1861. Graduating at the head of his class from the U.S. Naval Academy, he was sent by the Navy Department to the British Royal Naval College at Leeds, and on his return was transferred to the construction department of the Navy; in 1890 he designed the battleships *Oregon*, *Indiana*, and *Massachusetts*. He resigned from the Navy to enter business as superintendent of construc-

tion for the Cramp Shipyards, Philadelphia. In 1895 he established his own shipbuilding yards, where in six years he built 100 vessels, among them the submarine *Holland* and the cruiser *Chattanooga*. He organized the Standard Motor Construction Company and the International Smokeless Powder Company, and later established the Nixon Nitration Works. In succession to Richard Croker, he served briefly as leader of Tammany Hall (1901-02). He was superintendent of public works in New York State in 1919, and State public service commissioner 1919-20.

**NIZAMI OF GANJA** (1141-1203), Persian poet, was born near Ganja, in Arran, in 1141. His adolescent asceticism and religious piety were transformed at maturity into a more human Sufic mysticism and love of life made manifest in his great love poems and works of Oriental romance. His *Khusru and Shirin*, at once a love poem and great work of fiction, was completed about 1175, and followed about 1197 by the masterpiece called *The Seven Beauties*. In this work each of seven princesses tells a tale, one of which is the story of a Russian princess since made famous in Gozzi's *Turandot* and in adaptations. Nizami's poetical works on ethics and the Sufic mysteries are also well known. He died at Ganja in 1203.

**NIZHNI-NOVGOROD**, officially renamed **GORKY** on Oct. 7, 1932, is the administrative center of the Nizhni-Novgorod Region, R.S.F.S.R., in the Dyatlov Mountains. It is the commercial heart of Russia, with railroads, river traffic and airways linking it to all parts of the Soviet Union. Its world-famous fair, conducted annually since 1817, is the principal medium of exchange for Russia's commodities with the wares of the East. During the civil war following the 1917 Revolution the fair was discontinued, but was resumed in 1922. The city's three divisions are: the upper district, with its picturesque Kremlin, or fortress; the lower, the quarter of commercial institutions; and the river section, with a factory district, warehouses and the extensive fair grounds. Important local industries are machine-building, iron and copper smelting, and flour-milling. A large automobile plant was completed in Nov. 1931. There are also a zinc factory and plants producing agricultural implements, radio parts and telephones.

Nizhni-Novgorod is an educational center for this section of the Volga district, with a museum, university and normal college. The early 18th century Church of the Nativity of Our Lord is a remarkable example of Russian Baroque architecture; other imposing ecclesiastical edifices are the Church of St. George and the Blagovestchensky Cathedral. This inland metropolis was founded in 1221, and its geographical position gave it commercial importance almost at once. The site has been notable as a trade center from Roman times. Annexed to Muscovite territory in 1392, it became an outpost in the Russian struggles with the Tatars. At the beginning of the 19th century the city was the most prosperous community in all Muscovy. Pop. 1926, 220,819.

**NOAH**, a Hebrew patriarch, son of LAMECH, is called "the second father of mankind," because he and his family alone survived the Deluge. The Bible story relates that on account of his righteousness Noah found favor in God's sight and was chosen to build an ark, into which he and his family and a pair of all living animals went when God destroyed mankind because of its wickedness with a flood. According to the priestly account in Genesis, the Ark was made of gopher wood, a timber nowhere else mentioned in the Bible, and was covered with pitch, inside and outside. It had three decks, a door and a window but no mast, sail, rudder or oars. The Ark, according to some estimates, was 450 ft. long, 75 ft. broad and 45 ft. high. A similar story is told in the cuneiform inscriptions and in the early legends of other peoples.

In the Babylonian legend, Noah is called Hasis-Adra and Xisuthros, and the parallels between the stories are numerous. The Noah stories contain a second picture of the patriarch, showing him as having been the inventor of wine and the world's first drunkard. Some students believe that these stories relate to two men and assert that ENOCH was the real hero of the Deluge legends, a change in name possible by transposition of Hebrew letters. They also call attention to the report that the Deluge lasted 365 days and Enoch is said to have lived 365 years; also that Enoch is presented by Scripture as "the blameless man" who "walked with God," while Noah was a drunkard. Fragments of a lost *Apocalypse of Noah*, mentioned in the apocryphal *Book of Jubilees*, are found in the *Book of Enoch*, where he appears as a kind of solar hero. The story loses nothing, whichever patriarch was its hero.

**NOAILLES, ANNA-ELISABETH, COMTESSE MATHIEU DE** (1876- ), French poetess, was born in Paris, Nov. 15, 1876, of the princely Rumanian house of Bibesco-Brancovan. She passed her youth in Savoy, perhaps acquiring there that passionate love of nature which has caused her to be often compared to Francis Jammes. Among her poetical works are *Le Cœur innombrable*, 1901, *Les Éblouissements*, 1907, and *Les Forces éternelles*, 1920. Her novels include *La nouvelle Espérance* and *Le Voyage émerveillé*, 1904.

**NOBEL, ALFRED BERNHARD** (1833-96), Swedish inventor and founder of the Nobel prizes, was born at Stockholm, Oct. 21, 1833. He was educated as a chemist and engineer, and made a special study of explosives, particularly those derived from nitro-glycerin. By combining nitro-glycerin with an inert substance he produced dynamite, his most famous invention. Blasting gelatin is another of his inventions, as is also ballistite, one of the earliest of the nitro-glycerine smokeless powders. Nobel believed that his patent on ballistite also covered cordite, which came into use some time later, and he brought suit against the British government, but lost his case in court. He accumulated a large fortune from the manufacture of explosives and from the exploitation

of the Baku oil fields. By the terms of his will \$9,000,000 were set aside as a fund from the interest of which the prizes that bear his name were to be paid. Nobel died at San Remo, Italy, Dec. 10, 1896. See also NOBEL PRIZES.

**NOBEL PRIZES**, five monetary awards made annually to five men or women who have made pre-eminent contributions during the year to the cause of world-wide peace, or in the fields of physics, chemistry, literature and medicine. These awards were established in 1896, by the will of Alfred Nobel, the Swedish inventor of dynamite and other explosives. Nine million dollars was left in trust; the income of this sum is divided into five equal parts each year. The first awards were made in 1901. During the past few years, each prize has been worth over \$40,000. The trustees may divide a prize between two or more individuals or may withhold it if in their opinion there has been no worthy contribution during the year in that particular field of activity.

By the terms of Nobel's will, the awards in physics and chemistry are made by the Swedish Academy of Science in Stockholm. The award in medicine or physiology is made by the Caroline Medical Society of Stockholm, and that in literature by the Swedish Academy of Literature. The peace award is decided upon by a committee elected by the Norwegian Storting. On the whole, the awards have been generally hailed as unbiased and fair.

Madame Curie, co-discoverer of radium with her husband, P. Curie, is the only individual to whom any part of two prizes has been given. In 1903 with her husband she shared the prize for physics for the discovery of radium, and in 1911 she was awarded the full prize in chemistry for further investigations in the field of radio-activity.

In *Literature*, the Nobel prizes were awarded to the following: René François Sully-Prudhomme, France, 1901; Theodore Mommsen, Germany, 1902; Bjornstjerne Bjornson, Norway, 1903; Frédéric Mistral, France, and José Echegaray, Spain, 1904; Henryk Sienkiewicz, Poland, 1905; Giosue Carducci, Italy, 1906; Rudyard Kipling, England, 1907; Rudolf Eucken, Germany, 1908; Selma Lagerlof, Sweden, 1909; Paul Heyse, Germany, 1910; Maurice Maeterlinck, Belgium, 1911; Gerhart Hauptmann, Germany, 1912; Rabindranath Tagore, India, 1913; Romain Rolland, France, 1915 (not awarded in 1914); Verner Heidenstam, Sweden, 1916; Karl Gjellerup, Denmark, and Henrik Pontoppidan, Denmark, 1917; Carl Spitteler, Switzerland, 1919 (not awarded in 1918); Knut Hamsun, Norway, 1920; Anatole France, France, 1921; Jacinto Benavente, Spain, 1922; William Butler Yeats, Ireland, 1923; Ladislaw Reymont, Poland, 1924; George Bernard Shaw, England, 1925; Grazia Deledda, Italy, 1926; Henri Bergson, France, 1927; Sigrid Undset, Norway, 1928; Thomas Mann, Germany, 1929; Sinclair Lewis, United States, 1930; Erik Karlfeldt, Sweden, 1931; John Galsworthy, England, 1932.

In *Chemistry*, the Nobel prizes were awarded to the following: Jacobus van't Hoff, Germany, 1901; Emil

Fischer, Germany, 1902; Svante August Arrhenius, Sweden, 1903; Sir William Ramsay, England, 1904; Adolf von Baeyer, Germany, 1905; Henri Moissan, France, 1906; Eduard Buchner, Germany, 1907; Sir Ernest Rutherford, England, 1908; Wilhelm Ostwald, Germany, 1909; Otto Wallach, Germany, 1910; Marie Curie, France, 1911; Victor Grignard, France, and Paul Sabatier, France, 1912; Alfred Werner, Switzerland, 1913; Theodore William Richards, United States, 1914; Richard Willstätter, Germany, 1915; Fritz Haber, Germany, 1918 (not awarded in 1916 and 1917); Walther Nernst, Germany, 1920 (not awarded in 1919); Frederick Soddy, England, 1921; Francis William Aston, England, 1922; Fritz Pregl, Austria, 1923; Richard Zsigmondy, Germany, 1925 (not awarded in 1924); The Svedberg, Sweden, 1926; Heinrich Wieland, Germany, 1927; Adolf Windaus, Germany, 1928; Arthur Harden, England, and H. von Euler-Chelpin, Sweden, 1929; Hans Fischer, Germany, 1930; Carl Bosch and Frederick Bergius, both of Germany, 1931; Irving Langmuir, United States, 1932.

In *Physics*, the Nobel prizes were awarded to the following: Wilhelm Röntgen, Germany, 1901; Hendrik Lorentz and Pieter Zeeman, both of Holland, 1902; Antoine Henri Becquerel, Marie Skłodowska Curie and Pierre Curie, all of France, 1903; John Rayleigh, 3rd Baron, England, 1904; Philipp Lenard, Germany, 1905; Sir Joseph Thomson, England, 1906; Albert Michelson, United States, 1907; Gabriel Lippmann, France, 1908; Guglielmo Marconi, Italy, and Ferdinand Braun, Germany, 1909; Johannes Diderik van der Waals, Holland, 1910; Wilhelm Wien, Germany, 1911; Nils Gustaf Dälén, Sweden, 1912; Heike Kamerlingh Onnes, Holland, 1913; Max von Laue, Germany, 1914; William Bragg and Sir William Henry Bragg, both of England, 1915; Charles Barkla, England, 1917 (not awarded in 1916); Max Planck, Germany, 1918; Johannes Stark, Germany, 1919; Charles Guillaume, Switzerland, 1920; Albert Einstein, Germany, 1921; Niels Hendrik David Bohr, Denmark, 1922; Robert Millikan, United States, 1923; Karl Siegbahn, Sweden, 1924; James Franck and Gustav Hertz, both of Germany, 1925; Jean Baptiste Perrin, France, 1926; Arthur Compton, United States, and Charles Wilson, England, 1927; Owen Richardson, England, 1928; the Duc de Broglie, France, 1929; Sir Chandrasekhara Venkata Raman, India, 1930.

In *Medicine*, the Nobel prizes were awarded to the following: Emil Adolf von Behring, Germany, 1901; Sir Ronald Ross, England, 1902; Niels Ryberg Finsen, Denmark, 1903; Ivan Petrovic Pavlov, Russia, 1904; Robert Koch, Germany, 1905; Professor Ramon y Cajal, Spain, and Professor Camillo Golgi, Italy, 1906; Alphonse Laveran, France, 1907; Professor Paul Ehrlich, Germany, and Eli Metchnikoff, Russia, 1908; Dr. Albrecht Kossel, Germany, 1910; Allvar Gullstrand, Sweden, 1911; Dr. Alexis Carrel, United States, 1912; Professor Charles Richet, France, 1913; Dr. Robert Bárány, Austria, 1914; Dr. Jules Bordet, Belgium, 1919 (no prizes were awarded in 1915, 1916, 1917, 1918); Professor August Krogh, Denmark, 1920; Professor A.

V. Hill, England, and Professor Otto Meyerhof, Germany, 1922 (the prize was not awarded in 1921); Dr. F. S. Banting, Canada, and Professor J. R. McLeod, Canada, 1923; Wille Einthoven, Holland, 1924; Professor J. Fibiger, Denmark, 1926 (the prize was not awarded in 1925); Wagner-Jauregg, Austria, 1927; Dr. Charles Nicolle, France, 1928; Dr. Frederick G. Hopkins, England, and Dr. C. Eijkmann, Holland, 1929; Professor Landsteiner, United States, 1930; Otto Warburg, Germany, 1931; Sir Charles Sherrington and Professor Edgar Douglas Adrian, England, 1932.

The Nobel *Peace prizes* were awarded to the following: Henri Dunant, Switzerland, and Frédéric Passy, France, 1901; Élie Ducommun and Charles Gobat, both of Switzerland, 1902; Sir William Cremer, England, 1903; Institute of National Law, 1904; Baroness von Stuttner, Austria, 1905; Theodore Roosevelt, United States, 1906; Ernesto Moneta, Italy, and Louis Renault, France, 1907; Klas Arnoldson, Sweden, and Fredrik Bajer, Denmark, 1908; Auguste Beernaert, Belgium, and Baron de Constant, France, 1909; International Peace Bureau, Switzerland, 1910; Tobias Asser, Holland, and Alfred Fried, Austria, 1911; Elihu Root, United States, 1912; Henri LaFontaine, Belgium, 1913; International Red Cross of Geneva, 1917 (not awarded in 1914, 1915, 1916); Woodrow Wilson, United States, 1919 (not awarded in 1918); Léon Bourgeois, France, 1920; Hjalmar Branting, Sweden, and Christian Lange, Norway, 1921; Fridtjof Nansen, Norway, 1922; Charles Gates Dawes, United States, and Austen Chamberlain, England, 1925 (not awarded in 1923 and 1924); Aristide Briand, France, and Gustav Stresemann, Germany, 1926; Ludwig Quidde, Germany, and Ferdinand Buisson, France, 1927; Frank Billings Kellogg, United States, 1929 (not awarded in 1928); Nathan Soderblom, Sweden, 1930; Nicholas Murray Butler and Jane Addams, United States, 1931.

**NOBLE, ALFRED** (1844-1914), American civil engineer, born in Livonia, Mich., Aug. 7, 1844. He did important engineering work on the Saint Mary's Falls Canal and River, and on the Washington Bridge, N.Y., and other bridges. He served on the Nicaragua Canal Board, the United States Board of Engineers on deep waterways, and the Isthmian Canal Commission. Noble was chief engineer of the Pennsylvania Railroad tunnels under the East River, and of the terminal construction of that road in New York. He died Apr. 19, 1914.

**NOBLE, G. KINGSLEY** (1894- ), American zoologist and explorer, born in Yonkers, N.Y., Sept. 20, 1894. He received his A.B. and M.A. degrees from Harvard, 1917 and 1918, and his Ph.D. degree from Columbia, 1922. His association with the American Museum of Natural History began in 1919, when he was made assistant curator of herpetology. He became associate curator in 1922 and curator in 1924. He was a zoologist on the Harvard expeditions to Guadeloupe, 1914, Newfoundland, 1915, and Peru, 1916, and he led the American Museum expedition to Santo Domingo, 1922. In 1925, Dr. Noble became lecturer on vertebrate palaeontology at Columbia.

**NOBUNAGA** (1534-82), Japanese military leader who began the process of the establishment of a strong central government in Japan in the 16th century. He belonged to the powerful Taira clan. By 1568 he had secured control of 30 of the 66 provinces of Japan and had installed his nominee as what proved to be the last of the Ashikaga shoguns. Subsequently he extended his power, taking control on the death of the shogun. Nobunaga early came into conflict with the Buddhist priesthood, which had developed into a powerful political force, and he adopted a policy of welcoming the European missionaries and traders who began to visit Japan—the first Dutch ship arrived in 1541. He was a brilliant military genius but less of an administrator. He committed suicide when he found himself unable to escape from capture by an insubordinate army which had attacked him at Kyoto.

**NOCTES AMBROSIANAE** ("Ambrosian Nights"), a series of dialogues, written chiefly by Christopher North (*see* WILSON, JOHN) for *Blackwood's Magazine*, and published 1825-35. Very popular in their day because of their timeliness, humorous tone and biting wit, these dialogues were presented as literal reports of the meeting of various literary celebrities at Ambrose's Tavern, Edinburgh, and deal mainly with social, literary and political subjects.

**NOCTILUCA.** *See* LUNA.

**NOCTURNE**, a musical composition suggesting the dreamy and mysterious quality of the night; synonymous with the German *Nachstück*, or "night piece," and the Italian *notturno*. John Field's nocturnes for the pianoforte established this form of composition for that instrument, anticipating Frederic Chopin's famous 19 nocturnes for the same instrument.

**NODDY**, a genus (*Anous*) of tropical oceanic birds very closely allied to the terns, so called because of their exceptional tameness and seeming stupidity. They are birds of medium size with long bills, very long pointed wings and rounded tails; their plumage is a uniform dark sooty brown somewhat grayish on the head. Unlike terns, noddies are usually found on the open ocean, often at great distances from land, where they feed on crustaceans, floating animals and offal. They also differ from the terns in their flight, which is rather heavy and labored. The common noddy (*A. solidus*), widely distributed on tropical coasts, breeding in colonies on the Dry Tortugas, in the Bahamas and the West Indies, is the only species which reaches the United States.

**NODE**, the points determined on the celestial sphere by the line that forms the intersection of the orbit of the moon, a planet or a comet with the plane of the ecliptic. They are called ascending or descending depending on whether they mark the point where the heavenly body passes from the south side of the ecliptic to the north side, or vice versa. The term is also used to indicate the points where a double star orbit intersects the celestial sphere.

**NOGALES**, a city on the Mexican boundary of Arizona, the county seat of Santa Cruz Co., situated

in the Patagonia Mountains, 66 mi. south of Tucson. It is served by the Southern Pacific and the Southern Pacific of Mexico railroads. There is an international airport. A fence through the middle of the town divides the Mexican city from the American. Cattle ranching and mining are the leading interests of the region. Spanish missionaries visited this section in 1691. Tumacacori Mission, a national monument, is 18 mi. north. The city is the seat of Camp Stephen D. Little, a military post. Nogales was incorporated as a city in 1893. Pop. 1920, 8,460; 1930, 6,006.

**NOGI, MARESUKU** (1849-1912), Japanese admiral and patriot, was born at Hagi, Choshu, of a Samurai family. He participated in the Civil War, 1877, and the war with China, 1894-95, and became governor of Formosa. After a period of retirement he reentered the military service in the Russo-Japanese War in 1904, with the rank of general. His forces took a leading part in the siege of Port Arthur. Nogi contributed largely to the development of Japan in many ways other than military. His influence helped materially to maintain the older Samurai standards of loyalty and honor. On the death of his emperor, Sept. 1912, Nogi committed hara-kiri in accordance with the Samurai tradition in Japan.

**NOGUCHI, HIDEYO** (1876-1928), Japanese bacteriologist, was born in Inawashiro, Yama, Fukushima, Japan, Nov. 24, 1876. He received his M.D. degree from the Tokyo Medical College in 1897, and thereafter did postgraduate work in the United States and Europe, becoming affiliated with the Rockefeller Institute for Medical Research in New York in 1904. Noguchi introduced the cutaneous test of syphilis, was first to obtain a pure culture of the spirochete of syphilis and to establish the syphilitic nature of general paralysis and locomotor ataxia. He cultivated the microorganisms of infantile paralysis and rabies, devised a method for obtaining a sterile vaccine against smallpox, discovered the parasite of yellow fever and prepared a prophylactic vaccine and curative serum for combating this disease, and also isolated the parasite of many disturbances peculiar to South America. During his investigations, he contracted yellow fever and died in British West Africa on May 21, 1928. His published works include *Snake Venoms*, *Serum Diagnosis of Syphilis and Luetin Reaction*, and *Laboratory Diagnosis of Syphilis*. M.F.

**NOHUNTSITK**, one of the tribes of the Kwakiutl Indians speaking the Heiltsuk dialect of the Wakashan linguistic stock, and living at the lower end of Wikeno Lake on the coast of British Columbia, Canada.

**NOISE AND NOISE CONTROL.** As distinguished from a musical tone, a noise is usually characterized by the absence of a sustained pitch and by the absence of definite and simple relations between its elementary components.

Noise created indoors is amplified by repeated reflections from walls and ceilings (*see* ACOUSTICS OF BUILDINGS). Ordinary plaster walls reflect more than 95% of the sound which strikes them, so that many such reflections must occur before the energy of the

sound is dissipated. This condition is alleviated by surfacing ceilings and walls with highly sound-absorbent materials, thus increasing the rate at which the reflected sound is dissipated. A number of materials, composed variously of vegetable or mineral fiber, porous tile and porous plaster, are now on the market and are being used extensively for the quieting of large business offices, dining rooms and hospitals. By making metabolism tests, Donald A. Laird found that 19% more energy is consumed by office workers under noisy than under quiet conditions.

The most thorough-going study of noise abatement is that made in 1930 under the direction of the health authorities of New York City. This study showed that 36% of all complaints registered were caused by traffic noise, created by trucks, automobiles and the like, 16% by transportation noises, caused by elevated, street and subway cars, and 12% by radios. The principal recommendations for abatement called for means of enforcing existing ordinances, additional legislation and a campaign of public education to eliminate unnecessary noise.

P. E. S.

**NOLLE PROSEQUI** in law, a formal entry in the record that the plaintiff or the prosecutor will proceed no further. It is usually employed by the prosecuting officer in criminal cases as a means of dismissing the prosecution. Of common law the attorney general had an absolute discretion to enter a *nolle prosequi*. Statutes in some states and judicial decisions in some others have imposed some limitations. It terminates the prosecution but does not preclude a new one.

**NOMA:** As complication of Measles. See MEASLES.

**NOME**, an incorporated seaside town, on the Seward Peninsula, northwestern Alaska, situated on Behring Sea, in the second judicial division. Nome is a fur trading center and has commercial fisheries, but gold also has been a leading interest since its discovery on Anvil Creek in 1898, and in the sand of the beach in 1899. This was followed by the "mad" rush of thousands of fortune seekers to Alaska, so that by 1900 Nome, then called Anvil City, was a frontier metropolis of 20,000 people, with banks, hotels, stores and newspapers. The Nome region has produced approximately \$100,000,000 in placer gold, and is still yielding about \$1,500,000 a year. The population decreased enormously following the failure to find additional desposits of gold in the sands of the shore. Pop. 1920, 852; 1930, 1,213.

**NOMINALISM**, a philosophic position holding that particulars alone are real. It is one side of the scholastic controversy over the relation between particulars and universals. (See SCHOLASTICISM.) Which is real, the universal or the particular? Are particular things more real than ideas of them? Nominalism holds that things are more real than ideas about them. A concept is nothing more than a name which designates a number of particular things alike in kind. "A pie" is real, but "pie-ness," or the general idea of pie, is merely an abstraction drawn from a number of particular pies.

Historically the nominalistic position goes back to DEMOCRITUS. Roscillinus was its leader in the scholastic controversy over the existence of universals. The controversy between realism and nominalism occupied the great schoolmen of the Middle Ages to a very large extent. It was William of Occam, one of the champions of nominalism, who swept much of the dust from these musty arguments. He did it so successfully that simplicity in thought has become associated with the term "Occam's razor."

**NOMOGRAPHY**, a special type of graphical methods developed by Maurice d'Ocagne, *Le Calcul simplifié par les procédés mécaniques et graphiques* (1894; 2d ed., 1905) and various articles. See GRAPHICAL METHODS.

**NONA.** See ENCEPHALITIS LETHARGICA.

**NONCONFORMISTS**, an ecclesiastical term used in Great Britain and in the British colonies to denote those churches which do not belong to the "established" or Episcopal Church, and their members of these churches. Nonconformists are also known as Dissenters and Free Churchmen, the chief denominations of whom in Great Britain are the BAPTISTS, CONGREGATIONALISTS, Friends (see FRIENDS, SOCIETY OF), Methodists (see METHODISM), Presbyterians (see PRESBYTERIAN CHURCH), and Unitarians (see UNITARIANISM). The term Nonconformists originated in the 17th century to denote (1) those who declined to conform to certain practices of the National Church, such as the wearing of surplices during worship, or kneeling when receiving the sacrament, which in the minds of some savored of the practices of the ROMAN CATHOLIC CHURCH, and (2) those who, after the passage of the Act of Uniformity in 1662, ceased to worship in the Episcopal churches.

**NON-EUCLIDEAN GEOMETRY**, in its broader sense any geometry based on postulates different from those of Euclid. The fifth postulate of Euclid (see GEOMETRY) implies that through a given point one and only one parallel may be drawn to a given line. However, if the uniqueness of this parallel is denied, it is still possible to construct a perfectly coherent geometry, a Non-Euclidean geometry. Such geometries were first produced independently (c. 1823-30) by the Russian Lobachevsky and the Hungarian Bolyai. See GEOMETRY, EUCLIDEAN GEOMETRY. N. A. C.

See R. Bonola, *Non-Euclidean Geometry*, 1912.

**NON-EXPANSION ENGINES**, steam engines in which the valves do not cut off the steam supply and permit the steam in the cylinder to expand as the piston moves forward. Before the time of James Watt, the cylinder was connected with the BOILER during the entire stroke of the piston, so that the full boiler pressure was exerted at all times, and no advantage was taken of the internal energy of the steam. Even to-day, on certain types of STEAM ENGINES, the operation is practically non-expansion. On hoisting engines, which have no flywheel to smooth the irregularities of torque, the force acting upon the crank must be constant if the lifting force is to be

constant. Consequently, the steam valve is designed to permit steam to enter the cylinder during approximately seven-eighths of the stroke. *See also* EXPANSION ENGINES. L. H. Mo.

**NON-IMPORTATION AGREEMENTS**, in the Colonial era, pledges to abstain from the use of British goods, a frequently employed weapon of dissatisfied colonists in retaliation against the Crown's colonial policy. Resentment of the Stamp Act prompted such agreements in Boston, New York and other cities in 1765. The SONS OF LIBERTY were in part a vigilante association to enforce these agreements. After a lapse, the Townshend Acts in 1767 occasioned a renewal of these agreements by popular assemblies. The members of the Virginia House of Burgesses in 1769 signed a non-importation agreement in protest against the quartering of British troops upon Boston and New York. Despite the obvious difficulties of enforcement, this policy of passive resistance markedly affected British commerce. British exports to America declined sharply in 1769, recovering when most of the Townshend revenue measures had been repealed and the only active non-importation agreements were those pledging the members to boycott tea on which customs duties were paid. After the passing of the Intolerable Acts, committees of correspondence of several Massachusetts towns, including Boston, jointly resolved that the colonies join in a suspension of trade with Great Britain, and the First Continental Congress devised the machinery: the Association in which the signatory deputies declared a cessation of importation and consumption of any British goods after Dec. 1, 1774, and a cessation of exportation to Great Britain or the British West Indies after Sept. 10, 1775. This document provided for the creation of local committees to enforce the agreement and give relentless publicity to offenders. It was adopted by all the colonies save Georgia and New York; in these colonies local committees served the same ends.

**NONINTERCOURSE ACT**, an act of Congress, passed Mar. 1, 1809, forbidding commerce with France and England. While all Europe was involved in the Napoleonic Wars, France and England contended for supremacy of the high seas. American vessels were molested; and President Jefferson, hoping to prevent the United States from becoming embroiled in the war and to bring the belligerent countries to their senses by denying them American supplies, secured the passage of an Embargo Act, Dec. 22, 1807, closing all American ports except for coast-wise shipping. Its maritime trade stagnant, New England suffered severe economic depression. Federalists in Congress attacked Jefferson's policy, and the embargo policy was modified by the Nonintercourse Act. The act interdicted all British and French vessels from entering American waters, and forbade the importation of goods from England or France. Commerce with all other countries was permitted. The President was authorized to suspend the operation of the act against either belligerent

country whenever that country withdrew its restrictions upon American trade. The act was ineffective, and after little more than a year was repealed. On Mar. 2, 1811, when the United States and Great Britain were on the verge of war (*see* WAR OF 1812), Congress passed a second Nonintercourse Act prohibiting trade with Great Britain.

**NONPARTISAN LEAGUE**, an organization founded by A. C. Townley in 1915 as a means of emancipating the farmers of North Dakota from the excessive charges of middlemen and from the unfair practices of milling and financial interests. Gaining control of the Republican primaries and of the state legislature, Townley carried out his somewhat socialistic program by constitutional amendment and statute. In 1917 he established national headquarters at St. Paul, Minn., and extended the operations of the League over a dozen states, chiefly in the Middle West. With the collapse of wheat prices in 1920 the League went into rapid decline, but it still exerts some influence in North Dakota.

**NON-SHATTERABLE GLASS**. *See* SAFETY GLASS.

**NOODLES**, a dried paste product made of wheat flour and egg, rolled to a paperlike thinness and cut in strips of varying width or in fancy shapes. They are cooked in boiling water. Originally a German dish, they are now made in factories abroad and in the United States.

**BIBLIOGRAPHY**.—A. E. Leach, *Food Inspection and Analysis*, 1920.

**NOOKSAK**, a Salishan Indian tribe speaking the same dialect as the Squamish, of whom they may be a division, and reported to be living in three bands on the Nooksak River in Whatcom Co., Wash.

**NOOTKA**, a group of 22 Indian tribes speaking a single dialect of the Wakashan linguistic stock. These tribes, known locally as the Aht, occupied the territory on the western coast of Vancouver Island, Brit. Col., from Cape Cook south to Port San Juan and including the Makah of Cape Flattery, Wash. Each tribe has its own well-defined fishing and hunting grounds. When first known to early European voyagers, the Nootka had the distinction of being the only people on the coast to attempt the hunting of whales. Their chiefs had the sole privilege of throwing the harpoon which had a long detachable shaft made of spliced yew wood. They also carried on a large trade in dentalium shells. (*See* WAMPUM.) In social and religious organization the Nootka and SALISH are distinct from other groups of the North Pacific culture area.

**NO-PAR STOCK**, unvalued shares, as distinguished from stock issued with a specified nominal value. They became a part of financial practice in the 20th century and are now widely issued by many of the major corporations. Usually such shares may not be sold below a certain minimum price. Where under the par value system a corporation was limited in its charter to a certain limit in dollars, the limit in a no-par value share corporation is placed on the num-

ber of shares issued and this total number of authorized shares must appear on the face of each stock certificate. The shares then represent by their number the proportionate interest of the stockholder in the company. In actual practice no relationship exists between the par value, BOOK VALUE and market value of a given stock and because a specified par value implies that the equivalent value has been paid for the stock and exists in the assets, which may or may not be true, it is asserted that the phrase of the par value of \$100 misleads the uninitiated. The chief purpose of issuing unvalued shares is to avoid controversy as to over capitalization, the value of assets and the value of single shares. On the other hand there are those who advocate the older practice of fixing a par value for all stock, contending that it is necessary to have a par value for shares in order readily to determine the amount of share capitalization and for other purposes. In a corporation issuing no-par value stock the stockholder's proportionate interest in the assets are in ratio to the number of shares he holds, e.g., in an organization with an authorized capital of 10,000 shares the holder of ten shares of no par value stock would own a one-one thousandth interest. No-par shares are becoming increasingly popular in the United States.

**NORDAU, MAX SIMON** (1849-1923), Hungarian author, was born in Budapest, July 29, 1849. In 1880, he moved from Budapest to Paris, where he practiced medicine, meanwhile studying art, literature and social questions in his spare time. His book, *Degeneration*, an accusation of degeneracy against modern civilization, created a sensation. Nordau was a keen Zionist, but aroused the antagonism of the Jews owing to his approval of a plan to establish a Zionist headquarters in East Africa. Among other books by Nordau were *Conventional Lies of Our Civilization*; *Zionism and Morals and the Evolution of Man*. He died Jan. 23, 1923.

**NORDENSKJÖLD, NILS ADOLF ERIK, BARON** (1832-1901), Swedish explorer and scientist, born at Helsingfors, Finland, Nov. 18, 1832. His first experience in Arctic exploration came when he accompanied Otto Torell, the geologist, on an expedition to Spitzbergen. Nordenskjöld was made a professor when he returned to Sweden and served as mineralogical curator in the Swedish State Museum. He accompanied Torell on another expedition to Spitzbergen, and, in 1864, he headed an expedition to the same region. In 1867, he led an Arctic expedition which got as far north as lat. 81° 42'. In 1878-79 (the *Vega* expedition), he passed through the Arctic Ocean from European waters to Bering Strait, thus making the Northeast Passage, an accomplishment which many other explorers had attempted without success. In the following year, he was created baron. In 1883, he explored Greenland's inland ice sheet. He died at Stockholm, Aug. 12, 1901.

**NORDHAUSEN**, a picturesque city in the Prussian province of Saxony, on the Zorge River and the south slope of the Harz Mountains. It was mentioned

in 874 as an imperial residence, and Empress Matilda founded a nunnery there in 962. It was a free imperial town from 1220 to 1802. The walls are, for the most part, intact, and the late-Gothic cathedral and other churches and abbeys, together with the rathaus, maintain its medieval aspect. The famous "Nordhausen" liquor is distilled there. Nordhausen has other industries and trades in grain, cattle and lumber. Pop. 1925, 35,066.

**NORDIC**, a subdivision of the Europeid (white) race, frequenting Scandinavia, North Germany, the Baltic Coast and most of Great Britain, characterized physically by long and narrow head and face, narrow straight nose, massive skeletal structure, angular or oval countenance, blond (curly or straight) hair, blue eyes and fair complexion. While not recognized by the New English Dictionary, the term is also used to characterize anything pertaining to the Scandinavian and other Germanic peoples, and is likewise employed as a cant expression. See also RACES OF MANKIND: *Caucasoid Group*.

**NORDICA, LILLIAN** (1857-1914), American operatic soprano, was born at Farmington, Me., Dec. 12, 1857. After studying at the New England Conservatory of Music, and in Italy under San Giovanni, she made her début in 1879, singing *La Traviata* at Brescia. Returning to the United States after numerous European engagements she made her American début in 1883 at the Academy of Music, New York. In 1893 she appeared at the Metropolitan Opera, New York, where, with occasional interruptions, she sang for 15 years. She died at Batavia, Java, May 10, 1914.

**NORFOLK**, a city in Madison Co., in northeastern Nebraska, situated on the Elkhorn River and served by three railroads. It is a shipping center for grain and livestock and has machine and railroad shops, wholesale drug houses, threshing machine, door, sash and various other factories. In 1929 the manufactures reached an approximate total of \$2,000,000; the retail trade amounted to \$8,408,061. Norfolk was founded in 1866 and chartered in 1886. Pop. 1920, 8,634; 1930, 10,717.

**NORFOLK**, a port and independent city in Norfolk Co., southeastern Virginia. It is situated on Hampton Roads, Elizabeth Tidal River and Chesapeake Bay. Bus and truck lines, ferries, 60 steamship companies and eight railroads serve the city. The harbor, able to accommodate more than 1000 ships at a time, had traffic in 1929 valued at \$816,298,165. The chief exports are coal and oil. The principal manufactures are food and tobacco products, farm supplies (fertilizer and feed), foundry and machine shop products, needle trades products and cement. Auto assembly, shipbuilding and marine repairs are important industries. In 1929 the factory output was worth about \$57,900,000; the wholesale trade proper amounted to \$74,127,757; the retail trade was valued at \$68,187,961. Norfolk has one of the largest naval bases in the country, a training station, a government hydrographic office and other federal activities, chief



among them the naval activities centering in the Hampton Roads Naval Operating Base. It was founded in 1680, burned in 1776 during the Revolutionary War and made a city in 1845. Pop. 1920, 115,777; 1930, 129,710.

**NORFOLK ISLAND**, a British island of the Pacific Ocean, lying between New Caledonia and New Zealand, about 1,100 mi. northeast of Sidney. It is 5 mi. long and covers an area of 13 sq. mi. Mt. Pitt, in the center, rises to a height of 1,000 ft. Norfolk is noted for its good climate and picturesque scenery. The soil is fertile and especially adapted to the growing of lemons, oranges, coffee and bananas. Formerly part of the colony of New South Wales, since 1914 Norfolk has been administered by the Commonwealth of Australia. In 1928 the population was about 1,000.

**NORICUM**, an ancient geographic district, south of the Danube. It was bounded by Pannonia on the east and Vindelicia and Rhaetia on the west and covered what is now Styria, Carinthia, Salzburg and parts of Bavaria and Austria. The first settlers were Celts, later ones were Romans. They were a prosperous, independent people, even after Noricum became nominally a Roman province in the 1st century. The country was famous for its iron and steel. Gold and salt were also abundant. The chief town was Noreia, the modern Neumarkt.

**NORITE**, an igneous rock of the GABBRO group. The characteristic minerals are PYROXENE of the ORTHORHOMBIC species, PLAGIOCLASE and OLIVINE. Important ORE DEPOSITS carrying CHALCOPYRITE, PENTLANDITE and PYRRHOTITE are associated with norite near Sudbury, Canada. They supply most of the world's NICKEL and some COPPER. *See also* IGNEOUS ROCKS; ORE.

**NORLIN, GEORGE** (1871- ), American educator, was born at Concordia, Kan., Apr. 1, 1871. He graduated from Hastings College, 1893; took his Ph.D. at the University of Chicago, 1900, and studied at the Sorbonne, Paris, 1902. Norlin taught Greek at Hastings College and at the University of Chicago, and in 1899 went to the University of Colorado as professor of Greek. In 1917 he became acting president there, and in 1919 president. He was the author of *Integrity in Education*, 1926, and editor and translator of works of Isocrates.

**NORMA** (gen. *Normae*), a very inconspicuous and small southern constellation near the Scorpion. *See* STAR: map.

**NORMA**, an opera in four acts by VINCENZO BELLINI, libretto by Felice Romani, who based the action on a tragedy by Alexandre Soumet; première, Milan, Dec. 26, 1831; first performed in the United States, Feb. 25, 1841, at New York. The work is considered the greatest of Bellini's operas.

The action takes place in a grove sacred to the Druids, in Gaul during the Roman occupation, and deals with the efforts of Norma, chief druidess, to win the love of Severus, Roman proconsul and enemy of the Druids. At the end Norma and her Roman

lover perish in a funeral pyre lighted by the kinsmen of the hapless priestess.

**NORMAL**, a town in McLean Co., central Illinois, situated 2 mi. from Bloomington. It is a residential suburb, served by two railroads, and has canning factories and greenhouses. The State Normal University is located here. Normal was incorporated in 1867 under a Special Charter. Pop. 1920, 5,143; 1930, 6,768.

**NORMALIZING**, a metallurgical operation in which steel is heated above the CRITICAL TEMPERATURE range and then cooled to below that range in still air at ordinary temperature. When a steel is received for examination of physical properties and microstructure, its previous history of heat treatment and mechanical treatment may be unknown. Regardless of what such history may have been, when it is heated above its upper critical temperature, most of the effects of previous mechanical treatment are lost and most of the effects of previous thermal treatment also disappear. If now the steel is allowed to cool in free air to ordinary temperatures, it develops properties and microstructure which are considered to be normal to its chemical composition. Z. J.

**NORMAL SCHOOLS.** *See* TEACHERS, PREPARATION OF.

**NORMAN, MONTAGU COLLET** (1871- ), British financier, was born 1871 at Moor Place, Much Hadham. He was educated at Cambridge and served with distinction in the South African War. During the World War his services were concerned with financial business of the war and brought him in contact with the Bank of England, which appointed him deputy governor in 1918. In 1920 Norman became the Bank's Governor and has held this office longer than any predecessor, being reelected in 1932.

**NORMAN**, a city and the county seat of Cleveland Co., situated a short distance from central Oklahoma, 18 mi. south of Oklahoma City. Two railroads serve the city. Graham Flying Service, a well-equipped airport, is just outside the city. Corn, cotton and livestock are raised in the vicinity. The University of Oklahoma, established in 1892, has its seat here. The State Hospital for Mental Diseases is located in Norman. The city was founded in 1889 and chartered in 1902. Pop. 1920, 5,004; 1930, 9,603.

**NORMANDY.** In 911 Rollo the Northman received in fief the region at the mouth of the Seine where he and his Vikings settled. The feudalism which developed in Normandy was peculiar in the extent to which the dukes controlled their vassals, exercised jurisdiction, enjoyed a revenue in money and maintained a local administration throughout the duchy. Carried by conquerors to England and Sicily these Norman institutions made important contributions to later constitutional development. After 1066 the dukes were also kings of England, and after 1152 Normandy was part of the Plantagenet empire. Philip Augustus annexed Normandy to France in 1204. In 1417 the English recovered the province and held it until the middle of the century.



**NORMANS**, the group of Norse invaders and colonists who settled Normandy and later made conquests in the British Isles, Italy and Sicily. Their adoption in Normandy of the French language, culture and feudal social structure differentiates them from the Scandinavian sea-rovers, who retained their own language and customs. (See ENGLAND: *History*; ITALY: *History*; SICILY: *History*.)

A band of Northmen under Hrolf, or Rollo, in 911 obtained by treaty from Charles the Simple the district later called Normandy, consisting of the town of Rouen and a portion of the sea-coast. To this Bessin and Maine were later added. William, the illegitimate son of Count Robert the Devil, and a descendant of Rollo, in 1066 invaded England, defeated King HAROLD at Hastings, and the same year was crowned king. (See WILLIAM THE CONQUEROR.) The Normans subsequently extended their conquests into Wales and Ireland. They made no conquest in Scotland, but many Normans entered the country, ultimately fusing with the inhabitants. During the 11th century ROBERT GUISCARD acquired Apulia and Calabria in southern Italy; Sicily was conquered by Roger Guiscard, whose son, Roger II, in 1127 united the two domains with the title of king. The Normans subsequently took a leading part in the Crusades.

The enterprise and urge toward domination which carried the Normans to new conquests were combined with great powers of adaptation and assimilation. In France they adopted the French civilization; in England they became a part of the English nation. Apparently disappearing as a separate entity, they imparted their characteristic strength to peoples with whom they became incorporated.

**NORMAN STYLE**, in architecture, the Romanesque style of Normandy and Norman England. It is characterized throughout by heavy construction and the decorative emphasis of structural members, daring and progressive vaulting experiments, and a great use of abstract and geometric ornament, especially the zigzag. After the death of William the Conqueror, the styles in England and France became more and more independent of each other. The English tendency was towards great length in church design, tremendous piers, often circular, great relative height of the pier arches, and lavish decorative richness. The French trend was towards height rather than length, smaller, more subdivided piers, and quieter more structural surface treatments. Both schools were important in their vaulting experiments, for it was the Norman architects who first developed the ribbed, groined vault of the Lombards into a flexible system, and so laid the foundation of Gothic architecture. For bibliography see ROMANESQUE ARCHITECTURE.

**NORRIS, CHARLES GILMAN** (1881- ), American novelist, was born at Chicago, Ill., Apr. 23, 1881. He was educated at the University of California, and married Kathleen Thompson, who became the popular novelist, KATHLEEN NORRIS. He was assistant editor of *Country Life in America* in 1903, then with

the *Sunset Magazine*, and from 1908-13 was art editor of *The American Magazine*. His experiences in the World War, in which he attained the rank of major, may account in some part for the power and boldness of his novels. Among those which have made a distinct impression upon the reading public are *Salt*, 1918, *Brass, Bread and Seed*, 1930.

**NORRIS, FRANK** (1870-1902), American novelist, was born in Chicago, Ill., Mar. 5, 1870. He was educated at the University of Chicago and at Harvard, studied art in Paris and served as a war correspondent in South Africa and Cuba. His published works include short stories and three novelettes, but he won his position in American literature by the striking achievement of his unfinished trilogy on wheat which has influenced fictional trends in the United States. The first volume, *The Octopus*, 1901, pictures the growing of wheat, the second, *The Pit*, 1903, deals vividly with board of trade gambling in wheat, while the theme of the third, *The Wolf*, would have told of the consumption of the wheat in Europe. An earlier novel, *McTeague*, 1899, is a notable story of the San Francisco slums. Norris stands out as one of the first authentic realists in American literature. He died Oct. 25, 1902.

**NORRIS, GEORGE WILLIAM** (1861- ), American public official and liberal leader, was born in Sandusky Co., O., July 11, 1861. After graduating from Indiana Normal College in 1881, he studied law and began practice in 1883. Two years later he left Ohio for Nebraska where he continued practice and joined the Republican Party. He was elected Prosecuting Attorney of Furnas Co. for three terms, and was then a judge during 1895-1902. He was elected Representative to Congress for 1903-13, where, in 1910, he led the struggle to amend the rules so that the Committee of Rules was to be elected by the House, and the Speaker to be excluded from membership on it. This ended the power of the Speaker, JOSEPH CANNON, to determine the order of business and the special rules of procedure in the lower House. Norris was elected to the Senate in 1913 and, after opposing American entry in the World War, was reelected in 1918, 1924, and 1930. Although a Republican Norris was one of the leaders of the insurgent wing of the party, and in 1928 refused to support Hoover, the presidential nominee of his party, speaking and voting for Alfred E. Smith. In the 71st session, 1930-31, he continued his unsuccessful fight to force the Government to operate its great power plant at Muscle Shoals.

**NORRIS, KATHLEEN** (1880- ), American novelist, née Kathleen Thompson, was born in San Francisco, Cal., July 16, 1880. She was educated privately and then entered newspaper work. Soon after her marriage in 1909 to CHARLES G. NORRIS, she began writing short stories and contributed extensively to magazines. Her first novel, *Mother*, 1911, won unusual attention. Among her books are *Sister, Certain People of Importance*, *Hildegard*, *The Callahans and the Murphys*, and *The Love of Julie Borel*, 1931.

Mrs. Norris's fiction depicts graphically the life of the middle classes.

**NORRISTOWN**, a borough and county seat of Montgomery Co., southeastern Pennsylvania, on the Schuylkill River 17 mi. northwest of Philadelphia, served by the Pennsylvania, the Reading and electric railroads, motor bus lines and an airport. Chiefly a residential suburb, Norristown also manufactures textile machinery, children's hosiery and other products. In 1929 the value of the factory output was about \$17,900,000; the retail trade amounted to \$17,414,005. A state hospital for the insane is located here. Norristown was founded and named for Isaac Norris in 1784 and was laid out by William Moon Smith, son of the proprietor of a plantation, who had purchased it from Isaac Norris. VALLEY FORGE, of Revolutionary fame, is 8 mi. distant. Winfield Scott Hancock, Civil War general, was born here. The borough was incorporated in 1812. Pop. 1920, 32,319; 1930, 35,853; 7% were foreign-born, 6% colored.

**NORRKÖPING**, the fourth largest city of Sweden, situated on the banks of the Motala River at its mouth in the Baltic Sea, about 100 mi. southwest of Stockholm. The city is well built and is important industrially. The chief industries are shipbuilding and the manufacture of sugar, textiles, paper, carpets and cigarettes. Several times in the early 19th century Norrköping was partly destroyed by fire and of necessity rebuilt. Pop. 1931, 61,710.

**NORSE**, the early form of the Scandinavian language, also spoken for periods in northern Ireland and Scotland, the Isle of Man, the Shetland and Orkney islands, and the Hebrides. Its modern equivalent is classical Icelandic. Norse was the lingual parent of a host of early Norwegian dialects. The earliest inscriptions are not older than 1050, but these make references to the primitive forms of the same tongue in old sagas of the 9th century. After Norway and Sweden united in the 14th century, Norse was somewhat softened, and the Danish influence in the 15th century accelerated the movement away from the original tongue.

**NORTH, CHRISTOPHER.** See WILSON, JOHN.

**NORTH, SIR DUDLEY** (1641-91), English economist, 4th son of the 4th Lord North, was born at Westminster, May 16, 1641. He engaged in foreign trade, was made sheriff of London in 1682, in which year he was knighted, and held the position of Commissioner of Customs. A believer in free trade, his *Discourses upon Trade* established him with Locke and SIR WILLIAM PETTY as one of the three great economists of the period. He died Dec. 31, 1691.

**NORTH, FREDERICK, LORD** (1732-92), English statesman, was born April 13, 1732. He was educated at Eton and Oxford and then made a tour of the continent. At the age of 22 he was elected to parliament for Banbury and sat for the same town for almost 40 years. He was popular, being amiable and humorous, and showed great ability in public office. When he became Prime Minister in 1770 he was hampered by the high-handed manner of George

III, but facing the rising revolt in America, as Burke said of him, "he wanted something of the vigilance and spirit of command which the times required." After Yorktown North resigned, the king bestowing on him the Order of the Garter, but he did not retire from affairs and later was Secretary of State, and even when quite blind continued in public life. At the death of his father he became Earl of Guilford in 1790, and died two years later, Aug. 5, 1792.

**NORTH, SIR THOMAS** (1535-1601), English translator, was born about 1535. He was educated at Cambridge and studied law. In 1588 he was a captain, and was knighted about 1591. His translation of *Plutarch's Lives*, from the French of JACQUES AMYOT, his principal work, was published in 1579 and dedicated to Queen Elizabeth. It has given him permanent fame as a writer of clear, vigorous English, and from it Shakespeare derived much material for his Roman plays. Other works are his translations of a Spanish adaptation of the *Meditations of Marcus Aurelius* and of *The Morall Philosophie of Doni*. North died about 1601.

**NORTH ADAMS**, a city of Berkshire county in northwestern Massachusetts, 18 miles northeast of Pittsfield. It is on the Hoosac River about two miles from the western end of the Hoosac tunnel. Transportation is provided by the Boston & Maine and the Boston & Albany railroads. The chief manufactures are cotton and woolen goods, leather and shoes. Manufacturing production for 1929 was \$24,015,653; retail business, \$10,600,477. North Adams is the seat of a state normal school. It was incorporated as a city in 1895. Pop. 1920, 22,282; 1930, 21,621.

**NORTH AMERICA**, a continent of the Western Hemisphere, lying entirely north of the Equator with its northern boundary within the Arctic circle. Its total area of approximately 8,500,000 sq. mi. includes the main body of land and the nearby islands; the West Indies off the southeastern coast, the Hawaiian and Aleutian islands to the west, the Canadian archipelago and Greenland to the north. The mainland is situated between 7° 30' and 72° N. lat. and 56° and 168° W. long., but the islands increase the width to 20° W. and 172° E., the northern extent to 82° N. within 450 mi. of the pole. The Arctic Ocean lies on the north, and the Atlantic and Pacific oceans on the east and west respectively. To the south the land tapers down to the Isthmus of Panama which connects it with the continental body of South America. The Gulf of Mexico and Caribbean Sea lie between the mainland and the West Indies.

**Surface Features.** Considered as a unit, North America has a simple and orderly arrangement of clearly defined features. Dominating the whole are the mountain systems which follow the east and west margins. The Appalachians on the east are a series of old, worn-down ranges which stretch from New Brunswick, Can., to the plains of the Gulf of Mexico. The massive Cordilleran system on the west begins in Alaska and follows the slanting coastline to the Isthmus of Panama. Between these uplifts is a great

open plain extending from the Arctic region to the plains of the Gulf of Mexico, a distance of about 3,000 mi. The continent as a whole has a mean elevation of 1,300 ft. above sea level. Its highest point is Mt. McKinley in Alaska, 20,300 ft., and the lowest is Death Valley in California, 276 ft. below sea level.

The Cordilleran system consists of the Rocky Mountains of Alaska, the United States and Canada; the Selkirks of British Columbia; the Cascades of Washington and Oregon and the Sierra Nevada of California; and the Sierra Madre of Mexico. In Alaska the mountains are remarkable for their immense glaciers. On the St. Elias range which borders the southern coast between Glacier Bay and the Kenai peninsula, there are 25 active glaciers which discharge their slowly-flowing ice rivers into the Gulf of Alaska. The Malispina glacier, 1,200 sq. mi. in extent, is on the southern slope of Mt. St. Elias, 18,008 ft. high. The Aleutian range contains the Valley of Ten Thousand Smokes surrounded by a group of active volcanoes including Katmai, the eruption of which in 1912 was one of the most violent in history.

The Rockies in Canada have some of the highest peaks in that system, including Mt. Logan, 19,850 ft. Their glacier-clad summits in close contrast with their dense evergreen forests provide some of the grandest scenery of the entire continent. In the United States the Rockies form a continuous high barrier as far as the 35th parallel except in Wyoming where there is a gap allowing easy communication from east to west. The backbone of this system is the CONTINENTAL DIVIDE, or water parting for the main rivers.

The Cascade-Sierra Nevada chain which lies near the Pacific coast, reaches its greatest height in California where Mt. Whitney rises to 14,496 ft. Between this chain and the Rockies is the Columbia plateau, a broad lava field drained by the Columbia River; the Great Basin, an arid region of internal drainage containing Great Salt Lake; and the Colorado plateaus consisting of the plateau and canyon country drained by the Colorado River and its tributaries. The Great Basin and similar basin-and-range regions south of it, such as the Mohave desert of California and the Sonoran desert of Arizona, constitute the only desert on the continent.

In Mexico the Sierra Madre Mountains form two chains, one on either side of the Mesa Central, a high plateau which rises to 8,000 ft. South of Mexico City the mesa ends abruptly with a row of towering volcanoes including Orizaba, 18,564 ft. high, and Popocatepetl, 17,540 ft. high. Continuing through Central America the mountains are characterized by an extensive development of volcanoes which rise to between 10,000 and 13,000 ft.

The Appalachian mountain system consists of the Notre Dame Mountains in Quebec, and in the United States of the Green and White mountains, the Adirondacks, Catskills, Allegheny ridges, Blue Ridge and Cumberland mountains. Mt. Mitchell, 6,711 ft. high, in the Blue Ridge of North Carolina is the loftiest summit.

The great lowland region between the east and west mountain system is divided broadly into the Canadian Shield and prairie plains of Canada, and the Central Lowland and Great Plains in the United States. The Canadian Shield, comprising a large area surrounding Hudson Bay, extends to the Atlantic Ocean on the east and is bounded on the west and south by a line drawn through the lakes of Great Bear, Great Slave, Athabaska, Winnipeg, Lake of the Woods, the Great Lakes, and the St. Lawrence River. It is a region of moderate relief, the boldest features being river valleys, lake basins and occasional rocky hills. Much of it is forested. The prairie plains reach from the Shield westward to the Rocky Mountains. They are relatively flat and constitute the great wheatlands of Canada as far north as that grain will ripen. Along the northern coast the Arctic meadows support a scattered growth of mosses, lichens and stunted trees.

In the United States the belt of short grass country east of the Rocky Mountains, generally 400 mi. wide, is known as the GREAT PLAINS and is used chiefly as a grazing range. East of it, reaching to the APPALACHIAN MOUNTAINS, is the wide Central Lowland which is one of the largest and most productive agricultural regions in the world. It is drained by the longest drainage system in the world composed of the Mississippi-Missouri rivers with over 40 tributaries of which many are major streams. The Ohio is 981 mi. long, the Arkansas 1,460 mi., the Platte 1,252 mi., and the Red River of Texas 1,275 mi. Besides this system there are other large rivers in the United States and several in Canada. The Pacific Ocean receives the Lerma, 540 mi. long, the only large river in Mexico; the Sacramento-San Joaquin, 750 mi. long, from California; the Colorado, about 2,000 mi. long and its tributary the Gila, 550 mi. through the Gulf of California; the Columbia, 1,270 mi., of which the Snake, 939 mi. long, is a tributary; the Fraser, 740 mi., and, through the Bering Sea, the Yukon, 2,300 mi. long. Flowing to the Arctic Ocean are the MacKenzie, 2,525 mi. long, with its tributaries the Peace, 1,067 mi. and Athabaska, 765 mi.; and, through Hudson Bay, the Nelson-Saskatchewan, over 2,300 mi. Of those which reach the Atlantic Ocean the largest are the St. Lawrence, 750 mi.; the St. John, 500 mi.; the Hudson, a fiord type of stream, 315 mi.; the Delaware, 315 mi.; and the Susquehanna, 422 mi. The Rio Grande, 1,650 mi., which receives the Pecos, 800 mi. long, empties into the Gulf of Mexico.

Canada is particularly well-favored with lakes of which the largest are Great Bear, 11,821 sq. mi., partly within the Arctic circle; Great Slave, 10,719 sq. mi.; Lake Winnipeg, 9,460 sq. mi., and Athabaska, 2,842 sq. mi. Between the United States and Canada are the five Great Lakes with a combined area of 94,710 sq. mi., the greatest body of inland fresh water in the world. In Central America, Lake Nicaragua has an area of 3,700 mi.

The coastline of the continent is extremely irregular with numerous good harbors. Its northern extent is a maze of inlets and bays, of which Hudson Ba-

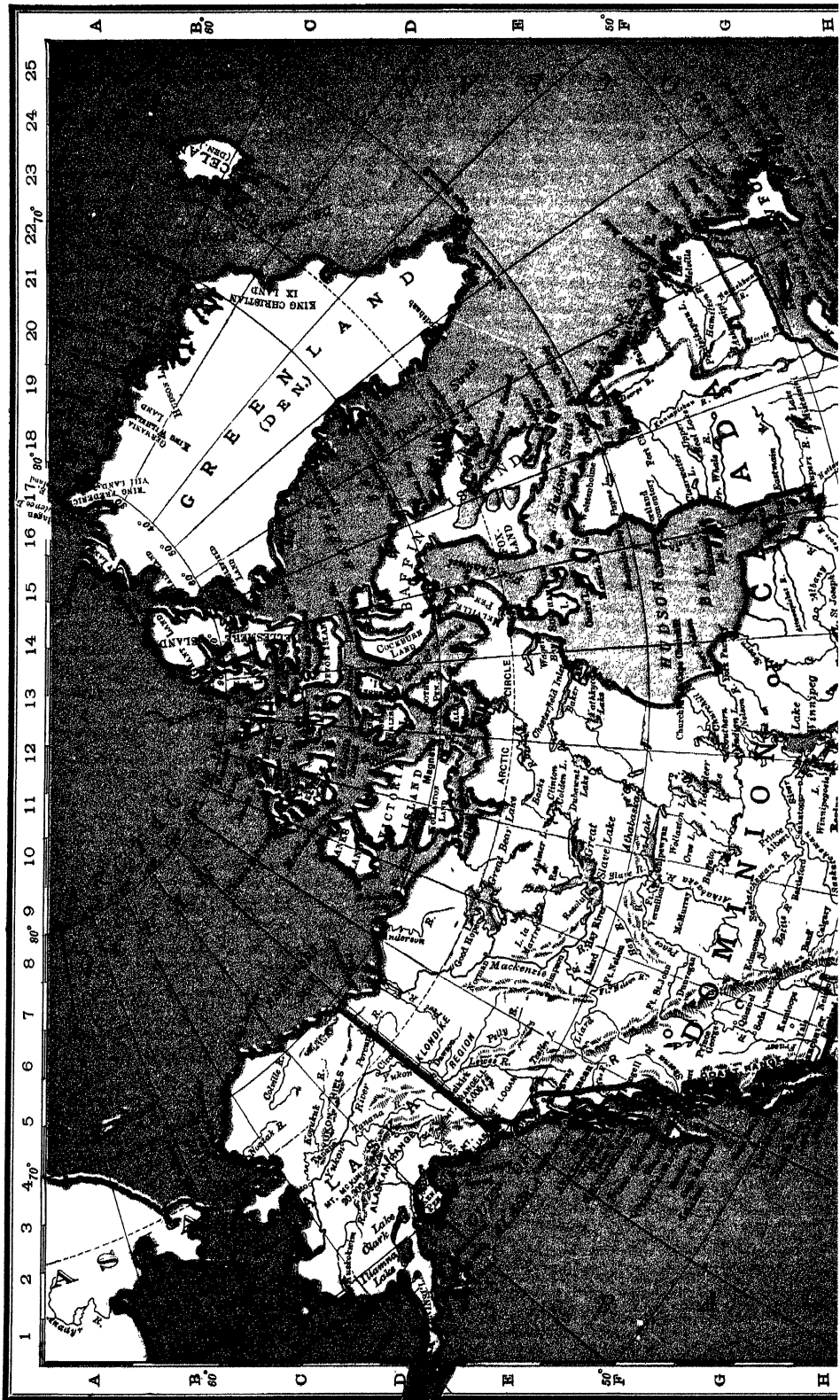


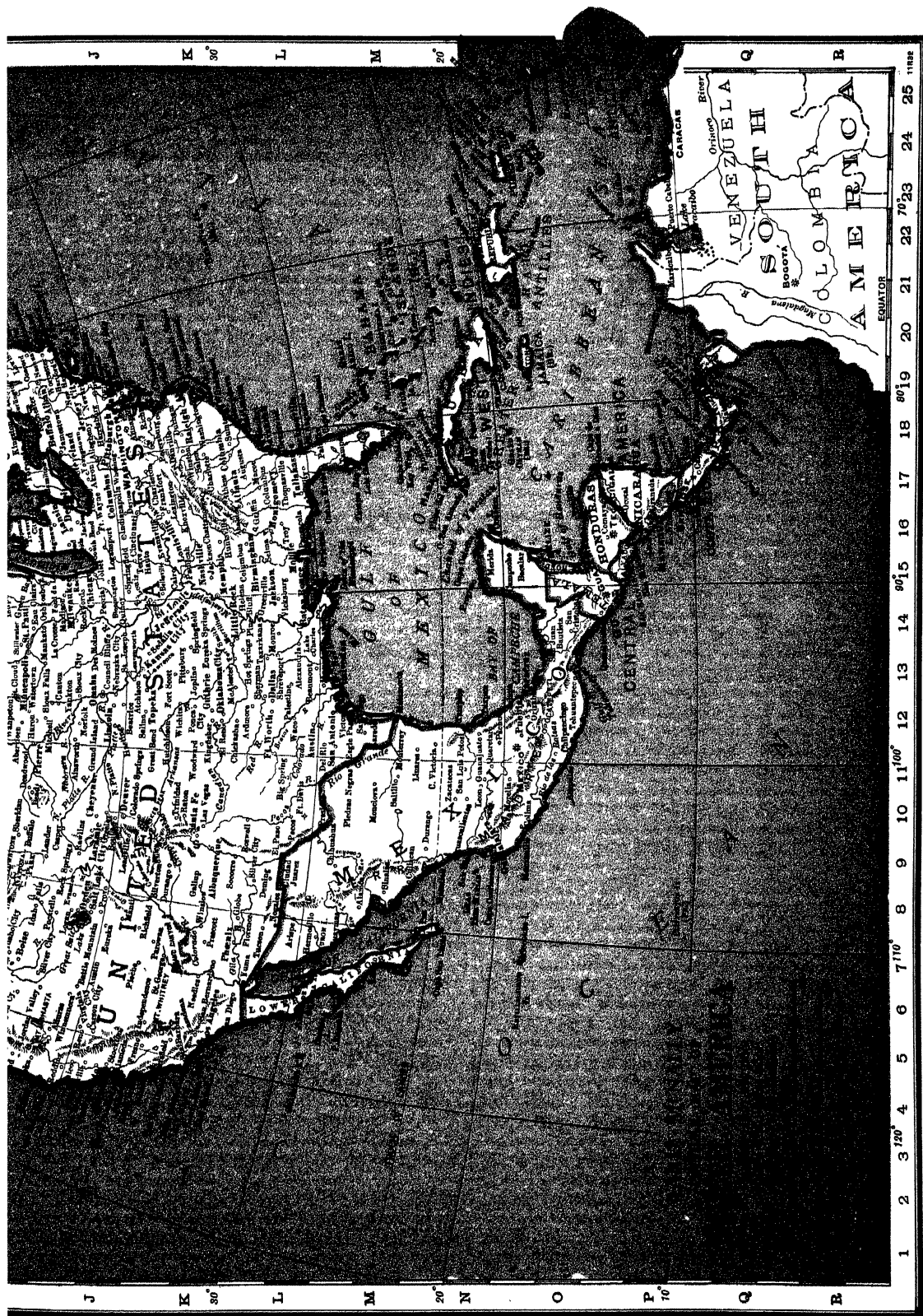
# NORTH AMERICA

Ar. 8,684,967 sq. m.  
Pop. . . . . 167,329,535

## COUNTRIES

ALASKA (U.S.) C 4  
Ar. 586,400 sq. m.  
Pop. . . . . 59,278  
BAHAMA Is. (Br.) M 21  
Area. 4,396 sq. m.  
Pop. . . . . 60,848  
BERMUDA Is. (Br.) K 23  
Area. . . . . 19 sq. m.  
Pop. . . . . 30,557  
BRITISH HONDURAS O 15  
Area. 8,598 sq. m.  
Pop. . . . . 51,228  
CANADA, DOMIN-  
ION OF (Br.) G 13  
Ar. 3,794,723 sq. m.  
Pop. . . . . 9,658,000  
CANAL ZONE (U.S.) Q 19  
Area. . . . . 549 sq. m.  
Pop. . . . . 89,467  
COSTA RICA Q 17  
Area. 28,000 sq. m.  
Pop. . . . . 516,031  
CUBA . . . . . N 19  
Area. 44,164 sq. m.  
Pop. . . . . 3,713,767  
DOMINICAN REPUBLIC N 22  
Area. 19,332 sq. m.  
Pop. . . . . 1,124,422  
GREENLAND (Den.) B 19  
Ar. 830,781 sq. m.  
Pop. . . . . 16,869  
GUADELOUPE AND MARTINIQUE (Fr.) O 25  
Area. 1,073 sq. m.  
Pop. . . . . 499,702  
GUATEMALA O 15  
Area. 42,353 sq. m.  
Pop. . . . . 2,163,546  
HAITI . . . . . N 21  
Area. 10,204 sq. m.  
Pop. . . . . 2,550,000  
HONDURAS P 16  
Area. 44,275 sq. m.  
Pop. . . . . 859,761  
JAMAICA (Br.) O 20  
Area. 4,450 sq. m.  
Pop. . . . . 994,419  
LABRADOR (Newf.) E 20  
Ar. 112,400 sq. m.  
Pop. . . . . 4,203  
LEEWARD Is. (Br.) N-O 25  
Area. . . . . 715 sq. m.  
Pop. . . . . 126,500  
MEXICO N 11  
Ar. 767,198 sq. m.  
Pop. . . . . 16,527,706  
NEWFOUNDLAND (Br.) G 22  
Area. 42,734 sq. m.  
Pop. . . . . 271,685  
NICARAGUA P 17  
Area. 51,660 sq. m.  
Pop. . . . . 750,000  
PANAMA Q 19  
Area. 32,558 sq. m.  
Pop. . . . . 467,469  
PUERTO RICO (U.S.) N 23  
Area. 3,435 sq. m.  
Pop. . . . . 1,543,913  
SALVADOR P 15  
Area. 13,176 sq. m.  
Pop. . . . . 1,437,365  
TRINIDAD (Br.) P 25  
Area. 1,974 sq. m.  
Pop. . . . . 413,119  
UNITED STATES J 12  
Ar. 3,026,789 sq. m.  
Pop. . . . . 122,775,046  
VIRGIN Is. (U.S.) N-O 24  
Area. . . . . 138 sq. m.  
Pop. . . . . 22,012  
WINDWARD Is. (Br.) O-P 25  
Area. . . . . 516 sq. m.  
Pop. . . . . 185,344







extends far into the interior of the country. On the east the estuary of the St. Lawrence River cuts a long, narrow gash into the mainland, and the headland of Nova Scotia and peninsulas of Florida and Yucatan project far beyond the general margin. On the west the long finger of Lower California reaches out into the ocean, the coast of Canada has an extensive fiord development, and the shore of Alaska is cut into numerous capes, headlands and peninsulas. The coastal plain has its most marked development in the United States along the shores of the Atlantic Ocean and Gulf of Mexico.

The topography of the islands belonging to North America is varied. The Aleutian Islands, 70 in number, which extend for about 1,000 mi. southwest from Alaska, are treeless and mostly uninhabited. The West Indies are largely of volcanic origin. Greenland lies practically within the frigid zone, and about 85% of its area is covered by a perpetual ice sheet which buries all but the highest mountains. Its coast is rocky and cut by deep fiords.

For a discussion of the geology and for additional details regarding the physiography of the continent see T. C. Chamberlin and R. D. Salisbury, *Geology*, 1907-09; L. V. Pirsson and C. S. Schuchert, *Textbook of Geology*, 1915; A. W. Grabau, *Textbook of Geology*, 1920-21; R. D. Salisbury, *Physiography*, 1907; the publications of the U.S. Geological Survey, especially *World Atlas of Commercial Geology*, 1921, and reports of various state geological surveys.

**Climate.** The mainland of North America lies mostly within the north temperate zone. Since it has no transverse mountain ranges, there is a free exchange of air between the arctic and subtropical regions across the broad interior plains, resulting generally in a wide range of temperature. At Edmonton, Can., the mean for Jan. is  $6.5^{\circ}$  F. and for July  $61^{\circ}$  and the extreme temperatures for the same months are  $-57^{\circ}$  and  $94^{\circ}$ , a range of  $151^{\circ}$ . For Toronto the extreme temperatures are  $103^{\circ}$  for summer and  $-26^{\circ}$  for winter. In the interior of the United States, Denver, which is situated on a plateau, has a mean of  $29.9^{\circ}$  for Jan. and  $72.2^{\circ}$  for July, and extremes of  $-29^{\circ}$  and  $105^{\circ}$  respectively for the same months; while St. Louis in the lowland has mean temperatures of  $78^{\circ}$  and  $31.1^{\circ}$  for its hottest and coldest months. At Yuma in the desert the mean temperatures for Jan. and July are  $54.4^{\circ}$  and  $90.8^{\circ}$  respectively, and the extremes  $22^{\circ}$  and  $120^{\circ}$ . Farther south the range in temperature is less. The averages for the hottest and coldest months in Mexico City, which is on a plateau, are  $64.9^{\circ}$  and  $54.1^{\circ}$ ; for Vera Cruz on the coast,  $81.3^{\circ}$  and  $70.2^{\circ}$ ; for San Salvador,  $78.8^{\circ}$  and  $74.7^{\circ}$ .

Temperatures in the Arctic zone are frigid. Point Barrow, Alaska, has mean temperatures of  $-19.1^{\circ}$  and  $40.3^{\circ}$  for Jan. and north Greenland has  $-36.2^{\circ}$  and  $3.2^{\circ}$  for the same months with a temperature of  $-19.3^{\circ}$  for the entire year.

The western coast is warmed by the Japan current and is therefore milder than the Atlantic shore which misses the influence of the Gulf Stream. At Victoria the averages for the hottest and coldest months are  $60.2^{\circ}$  and  $38.9^{\circ}$ ; at New York,  $73.5^{\circ}$  and  $30.6^{\circ}$ .

The high mountain barrier along the western margin causes the westerly winds to deposit abundant rainfall on the western coast. The panhandle of Alaska receives from 80 to 130 in. annually, Victoria 30.3 in. and San Francisco 22.2 in. The Great Basin receives less than 10 in. and Yuma averages 3.3 in. per year. The Great Plains east of the Rockies and west of the 100th meridian have generally less than 20 in. annually. Denver averages 14.3 in. and Edmonton 16.9 in. Over eastern and central United States and the whole of eastern Canada the rainfall is between 12 and 40 in. It increases from west to east and over the southeastern states is between 40 and 60 in. Tampa, Fla., averages 50.2 in. annually and New York 51.8 in.

Mexico and Central America are in zones of summer rainfall due to the monsoon winds which flow from the ocean over the heated lands. Vera Cruz receives about 61.9 in. annually and San Salvador 70.8 in.

**Fauna.** Though not possessing animals of such immense size as Asia and Africa, the land fauna of North America embraces many of the largest and most interesting forms native to the New World. Among these are some of the finest game animals and numerous valuable economic species. Especially conspicuous are various large carnivores and hoofed mammals found chiefly in the cool temperate, boreal and arctic parts of the continent. The bears, which include the polar, black, grizzly and brown bears, attain their greatest known size in Alaska. The larger hoofed mammals include the muskox, peculiar to North America; the caribou, the counterpart of the Old World reindeer, now successfully domesticated in Alaska; the American bison, popularly called buffalo; the moose, wapiti or American elk and various deer. Among the smaller ruminants are the pronghorn or American antelope, the Rocky Mountain goat, and several kinds of mountain sheep, known as bighorn.

Except the bears and the puma or cougar, there are no large carnivores north of Mexico. The ocelot is found from Texas southward and the jaguar occurs in Mexico and Central America. Among the lesser carnivores are the wolf, coyote, fox, raccoon, wolverine, and various small fur-bearers, including the mink, skunk and ermine.

The rodents include the beaver, muskrat, porcupine, hare, jackrabbit, pika, woodchuck, prairie dog, and numerous squirrels, pocket gophers, field mice and wood rats. The opossum is found in the southern United States; the peccary and the armadillo range from Oklahoma southward. In southern Mexico and Central America various tropical mammals abound, as monkeys, tapirs, sloths and anteaters.

Along both shores of the continent whales, porpoises, walrus and seals occur; on the Pacific coast sea lions, including the fur seal, and the sea elephant are found.

North of the Mexican boundary, about 1,400 kinds of birds are known, among which are numerous



game birds, as ducks, geese, grouse, quail, wild turkey, woodcock and snipe, and many song birds, as finches, orioles, mocking-birds, wrens and thrushes. The birds of prey are represented by eagles, hawks, buzzards, vultures and owls. Among native birds conspicuous for their size or plumage are various cranes, pelicans, herons, ibises and flamingoes. The ruby-throated humming-bird is widespread east of the Rockies; a western species ranges northward to Alaska. In Mexico, Central America, and the West Indies, tropical birds in great variety occur.

The reptiles include the alligator and crocodile, various turtles and tortoises, and many lizards and snakes. Among the lizards are the venomous Gila monster, the ugly chuckawalla, and the grotesque horned toads of western deserts. The numerous snakes are mostly harmless; the chief poisonous species north of Mexico are the copperhead, coral snake and water moccasin and various rattlesnakes.

Along the sea coasts and in the inland waters occur some 4,500 kinds of fishes. The marine species comprise many valuable food fishes, as the cod, herring, mackerel and salmon, and also highly prized game fishes, as the tarpon, tunny, and sailfish; the inland waters contain trout, bass, pike, perch, whitefish, catfish, sturgeon and other food and game fishes. Various shellfish, as oysters, clams and scallops, and crustaceans, as lobsters and shrimps, are of commercial importance.

**Flora.** In a general way the floral areas of the continent may be grouped in seven divisions: 1, the northern tundra region, 2, the eastern forest region, 3, the interior prairie region, 4, the Rocky Mountain region, 5, the great Basin region, 6, the Pacific coast region, and 7, the Gulf Coast region.

From northern Alaska through Canada to upper Labrador large areas are covered with the low, stunted Arctic vegetation called tundra, which grows on a frozen subsoil. Along the southern borders of the tundra are scattered areas of small trees, chiefly spruces and tamarack interspersed with poplars and birches. These increase in size and variety southward.

In the region extending from Manitoba to the Atlantic and southward to Georgia and Texas lie the eastern forests. At the north these consist chiefly of softwood conifers, which, in the central and southern states are largely replaced by deciduous hardwood trees. Stretching from the eastern forests to the eastern Rocky Mountains are the vast interior prairies, originally covered chiefly by grasses and known in their semi-arid western extension as the Great Plains.

The Rocky Mountain region has a diversified flora, often with desert plants on the foothills, dense coniferous forests on the higher slopes, and an alpine vegetation above the timber-line. Between the Rockies and the Sierra Nevada and Cascade ranges is the Great Basin region extending from British Columbia to Mexico with large areas of desert vegetation. In a narrow belt, west of the main mountain ranges, reaching from the Panhandle of Alaska to Lower California is the Pacific Coast region, with a very

distinct flora differing greatly from that of eastern North America or Asia. The Gulf Coast region, embracing southern Florida, the lowlands of Mexico and Central America and also the West Indies, possesses a rich tropical vegetation.

Among noteworthy plant groups which attain their maximum development in North America are the giant conifers of the Pacific coast; the immense variety of oaks, found in the Mexican highlands; the cactuses, which also reach their climax in Mexico, and the asters and goldenrods that dominate the autumn landscape in the eastern United States and Canada.

**Political Divisions.** The five major political divisions with approximate areas and population are: Alaska and the Aleutian Islands, a territory of the United States, 586,400 sq. mi., pop., 59,278; the Dominion of Canada, a division of the British Empire, 3,847,457 sq. mi., pop., 10,374,196; the United States, a federal republic of 48 states, 3,026,789 sq. mi., pop., 122,775,046; the republic of Mexico, 757,907 sq. mi., 16,404,030 people; and Central America, consisting of six independent states and a British colony, 224,960 sq. mi., 631,541 people.

Of the islands, Greenland, which belongs to Denmark, has an area of 827,300 sq. mi., and 14,803 people; the West Indies, some of which are independent and some dependencies of the United States and British Empire, have a combined area of about 90,100 sq. mi. and a population of over 10,000,000.

**Population.** The total number of people in North America, including those living on the islands, is about 155,500,000. The white race is predominant and is represented in Canada chiefly by people of English and French descent. The inhabitants of the United States are a mixture of the northern European and Latin races with about 10% Negroes and a small percentage of American Indians. In Mexico over half the people are mestizos, a mixture of the white race and native Indians. About one-quarter of the total population is pure Indian and only about one-eighth pure white. The inhabitants of Central America are similar to those in Mexico.

In Greenland the people are chiefly Eskimos and in the West Indies there is a mixed population of Europeans, Negroes and Indians.

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**NORTH AMERICAN INDIAN, LANGUAGES OF,** a geographical rather than linguistic term for the aboriginal languages spoken in Canada and the United States.

These tongues are classified into a considerable number of stocks of varying extent; but all investigation is rendered extremely difficult and uncertain because of the lack of historical data (the very earliest docu-

ments are only from the time of the coming of Europeans to the New World); by the unscientific character of accounts of them until recent times; and by the paucity of material for many of them. It is thus frequently impossible to determine whether present wide divergencies are inherent or are mere results of long, divergent evolutions—old forms have doubtless vanished, and new ones have been created. Even the number of stock is disputed, one scholar of the highest reputation (Boas) giving 55, and another (Rivet) only 26; and it still remains possible that stocks now considered unrelated may in future prove to be akin.

The North American languages cannot be reduced to any single type. They range from "polysynthetic," in which a number of distinct ideas are amalgamated into one word (eg., Tsimshian *t-yuk-ligi-lo-d'ep-däl-et* "he-began-somewhere-in-down-deposit it"), and "incorporating," in which the object is "incorporated" in the verb (e.g., Oneida *g-nagla'-sl-i-zak'-s* "I-living-abstract noun-verbal character-search-continuative sign" = "I am searching for a village"), to truly inflectional. Generally speaking, suffixes are more common than prefixes, and infixes are comparatively rare. The phonology and morphology are highly complex; and the grammatical categories, like the whole genius and structure, frequently differ radically from those of any other known linguistic groups. There is a tendency, however, as in MALAYO-POLYNESIAN, to divide the verb into the categories of active (closely related to the possessive forms of the noun) and neutral (treated as a true verb). None of the languages has been reduced to writing by natives with the exception of the Iroquoian Cherokee, for which Sequoyah (George Guess) invented a syllabary in 1826.

The families recognized by Rivet are as follows: Algonquin (Blackfoot, Cheyenne, Arapaho, Cree, Shawnee, Ojibwa, Lenape, Micmac, Wiyot, Yurok, etc.), Beothuk (extinct), Chimakum, Eskimo, Hoka (Shasta, Yana, Pomo, Yuma, etc.), Iroquois (Huron, Five Nations, Tuscarora, Cherokee, etc.), Kaddo (Pawnee, Arikara, etc.), Keres, Kiowa, Klamath or Lutuamian, Kutenai, Muskogee (Muskogee, Seminole, Choctaw, Creek, Natchez, etc.), Na-Dene (Chipe-way, Kuchin, Carriers, Hupa, Navaho, Apache, Haida, Tlingit, etc.), Penutia (Wintun, Maidu, Miwok, Takelma, Coos, Chinook, Tsimshian, etc.), Salish (Shuswap, Bellakula, etc.), Shahaptin (Nez Percés, etc.), Sioux, Tano, Timuka (extinct), Tunica (extinct), Ute (Shoshone, Hopi—cognate with Nahuatl or Aztec in Mexico), Waiilatpu, Wakash (Nutka, Kwakiutl, etc.), Yuchi, Yuki, and Zuñi.

L. H. G.

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**NORTH AMERICAN PARTY**, a defection from the AMERICAN PARTY, 1856, of those dissatisfied with that party's nomination of Millard Fillmore for president, preferring a candidate with stronger views upon

the exclusion of slavery from the domain north of 36° 30'. The North Americans in separate convention endorsed the Republican nominee, JOHN CHARLES FREMONT. A defection from this convention, objecting to Fremont for personal reasons, in separate caucus nominated Commodore Stockton for president.

**NORTHAMPTON**, the county town of Northamptonshire, England, lying on the Nene, 60 mi. northwest of London. A British and Roman settlement, it became an important Saxon center harried by the Danes from the 9th to the 11th centuries. Because of a great fire in 1675 very little of the ancient town survives, except in the County Hall and churches rebuilt shortly after the disaster. There are All Saints' Church retaining a Decorated tower, the cruciform 12th century St. Giles' and St. Sepulchre, one of the few round churches preserved in England to-day. The great Norman castle in which Thomas à Becket was tried and condemned, was razed in the last century to make way for a railway station. Since the reigns of John and Edward I, Northampton has been famed for the manufacture of boots and shoes. Currying, tanning, and textile weaving also are carried on. Pop. 1921, 90,895; 1931, 92,314.

**NORTHAMPTON**, a city in western central Massachusetts, a county seat of Hampshire Co., situated on the Connecticut River, 18 mi. north of Springfield. It is served by the Boston and Maine and the New Haven railroads and bus lines. There is an airport. SMITH COLLEGE, the largest American women's college, is located here. The chief local manufactures are silks, hosiery, brushes and filtration machinery. In 1929 the valuation of manufactures was \$14,582,277. In 1929 the retail business reached a total of \$12,750,850. Northampton was settled in 1654; it was incorporated as a city in 1883. Jonathan Edwards was a pastor here. The writers, Edmund Clarence Stedman and George W. Cable, also George Bancroft, the historian, and Calvin Coolidge have been residents of Northampton. Pop. 1920, 21,951; 1930, 24,381.

**NORTHAMPTON**, a borough of Northampton Co., in eastern Pennsylvania, situated on the Lehigh River, 15 mi. west of Easton; it is served by the Central of New Jersey, Northampton & Bath and Lehigh Valley railroads. In a rich cement district, Northampton manufactures cement, and has silk mills and tie and clothing factories. It was founded in 1740 and incorporated in 1901. Pop. 1920, 9,349; 1930, 9,839.

**NORTH ANDOVER**, a town of Essex Co., eastern Massachusetts, situated on the Merrimac River, about 28 mi. north of Boston. It is served by bus lines and the Boston and Maine Railroad. North Andover is primarily a residential community. Its manufactures include woolen goods and woolen mill machinery. Pop. 1920, 6,265; 1930, 6,961.

**NORTH ARLINGTON**, a rapidly growing borough of Bergen Co., N.J., situated on a high ridge between the Hackensack and Passaic rivers facing Belleville, 8 mi. west of New York City. It is served by electric trolleys and motor bus systems, including

lines operating on a direct highway to the Holland Tunnel. It is a residential community and is the home of many New York City and Newark workers. Pop. 1920, 1,767; 1930, 8,263.

#### NORTH ATLANTIC FISHERIES DISPUTE.

The Breton fishermen who followed JACQUES CARTIER to the banks of Newfoundland and Labrador developed a dependable commerce, so productive that boats of other nations appeared. England claimed Newfoundland by virtue of the voyage of Sir Humphrey Gilbert in 1583; France was forced to accede, in the TREATY OF UTRECHT, 1713, after a century of dissent. The establishment of the United States reopened the controversy, which has remained a constantly irritant factor in the international relations of the United States, Great Britain, Canada and Newfoundland.

The American negotiators of the TREATY OF PARIS, 1783, maintained that prior to independence the right of fishing in the North Atlantic was vested equally in the mother country and the colonies. The treaty provision reads: "It is agreed that the people of the United States shall continue to enjoy unmolested, the right to take fish of any kind on the Grand Bank and all the other banks of Newfoundland . . . and at all other places in the sea where the inhabitants of both countries used . . . that they shall have the liberty to take fish of every kind" on all coasts, bays and creeks of the British dominions in America. The conflict of definitions in the use of right and liberty was the basis of all subsequent disputes over the fisheries. The British contention, asserted at the close of the War of 1812, was that the liberty of coastal fishing, like other treaty arrangements, was automatically cancelled by the war. In 1815 American vessels were ordered from their accustomed North Atlantic waters. After a lengthy diplomatic exchange, the CONVENTION OF 1818 treated the problem; by this agreement the United States gained certain rights in perpetuity, but the area over which an American claim could be asserted was greatly restricted. Differences developed over the application of provincial regulations to American ships and to the form whereby the three-mile limit, for exclusively British fishing, should be measured, culminating in the WASHINGTON INCIDENT. The settlement of the fisheries dispute in the RECIPROCITY TREATY OF 1854 lasted only until 1866. An Order in Council of the Dominion of Canada, Jan. 8, 1870, ending the system used since 1866 of issuing special licenses to American vessels, made the fisheries a concurrent issue with the ALABAMA CLAIMS. The Treaty of Washington, 1871, among other pertinent provisions, created the HALIFAX FISHERIES COMMISSION. In 1878 the Fortune Bay Outrage revealed the instability of the settlement. The American Government terminated in 1885 the application of the fishery provisions of the Treaty of Washington, as a protective measure for the New England fishery interests. In 1888 a treaty providing for a complete settlement of the points in dispute failed of assent in the Senate; but a *modus vi-*

*vedi*, originally intended to meet the situation pending ratification of the treaty, was continued in force until Jan. 1924. By its terms American fishermen who purchased Canadian licenses were relieved of all other restrictions. Several negotiations with Newfoundland, 1902-07, served only to complicate the issue.

In 1908 Elihu Root, Secretary of State of the United States, and James Bryce, British ambassador at Washington, signed an arbitration convention referring the dispute to the HAGUE CONVENTIONS. An international commission exhausted the legal aspects of the dispute; the decision was revised by a joint commission of the four interested parties in 1912. The practical regulations to govern the conduct of the industry, however, were not yet certain. Under pressure of war conditions, in 1918 both countries agreed to accord to the fishing vessels of either country equal port privileges; in 1921 the United States canceled this legislation. The situation was further aggravated by the enactment of practically prohibitive tariffs against Canadian fish. The dispute still awaited definitive settlement in 1932.

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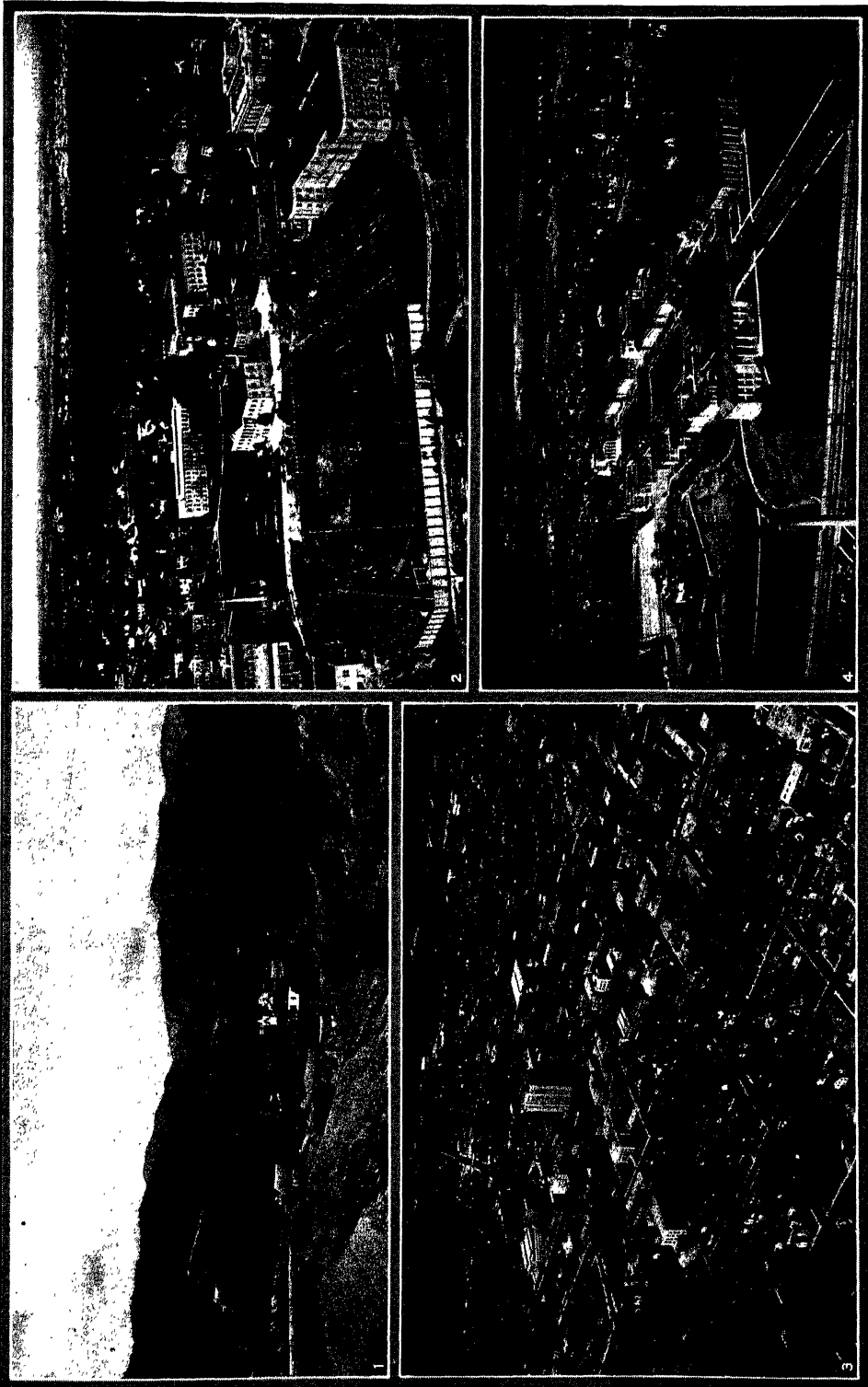
**NORTH ATTLEBOROUGH**, a town in Bristol Co. including North Attleborough village and Attleborough Falls, southeastern Massachusetts. It is served by the New Haven Railroad and bus lines. North Attleborough village is situated 12 mi. northeast of Providence, R.I. The town has factories making jewelry, silverware, tennis rackets, arch supporters and paper boxes. North Attleborough became a town in 1887. Pop. 1920, 9,238; 1930, 10,197.

**NORTH BAY**, a city in Nipissing District, northern Ontario, Canada, situated 200 mi. northwest of Ottawa, on the northeast shore of Lake Nipissing. A mining and lumbering town, served by four railroads, North Bay is the supply and distribution center of a large area yielding gold, silver and timber. It also is becoming, because of its pleasant and sporting environs, a summer tourist resort. It is the seat of a provincial laboratory. Pop. 1921, 10,692; 1931, 15,528.

**NORTH BERGEN**, a township of northeastern New Jersey, in Hudson Co., situated about 3 mi. north of Jersey City. The Erie and New York Central railroads, street car and bus lines afford transportation. North Bergen is an industrial and residential community with an area of 5 sq. mi. The North Hudson County Park and Playground, covering 165 acres, is located in the northern residential section. The township has a commission form of government. Pop. 1920, 23,344; 1930, 40,714.

**NORTH BRADDOCK**, a borough in Allegheny Co., southwestern Pennsylvania, 9 mi. southeast of Pittsburgh. It is served by three railroads and boats. Together with Rankin and Braddock, North Braddock forms one industrial community, and although North Braddock itself is chiefly residential,

# NORTH CAROLINA



2. CURTIS FLYING SERVICE PHOTO. COURTESY CHAMBER OF COMMERCE, RALEIGH. 3. NEW ENGLAND AIRWAYS PHOTO. COURTESY CHAMBER OF COMMERCE, GREENSBORO.  
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## NORTH CAROLINA CITIES AND COUNTRYSIDE

1. Rolling farm land seen from Morgan Hill near Asheville.
2. Air view of the North Carolina College of Agriculture and Engineering, Raleigh.
3. The campus and buildings of the women's college of Duke University at Durham.

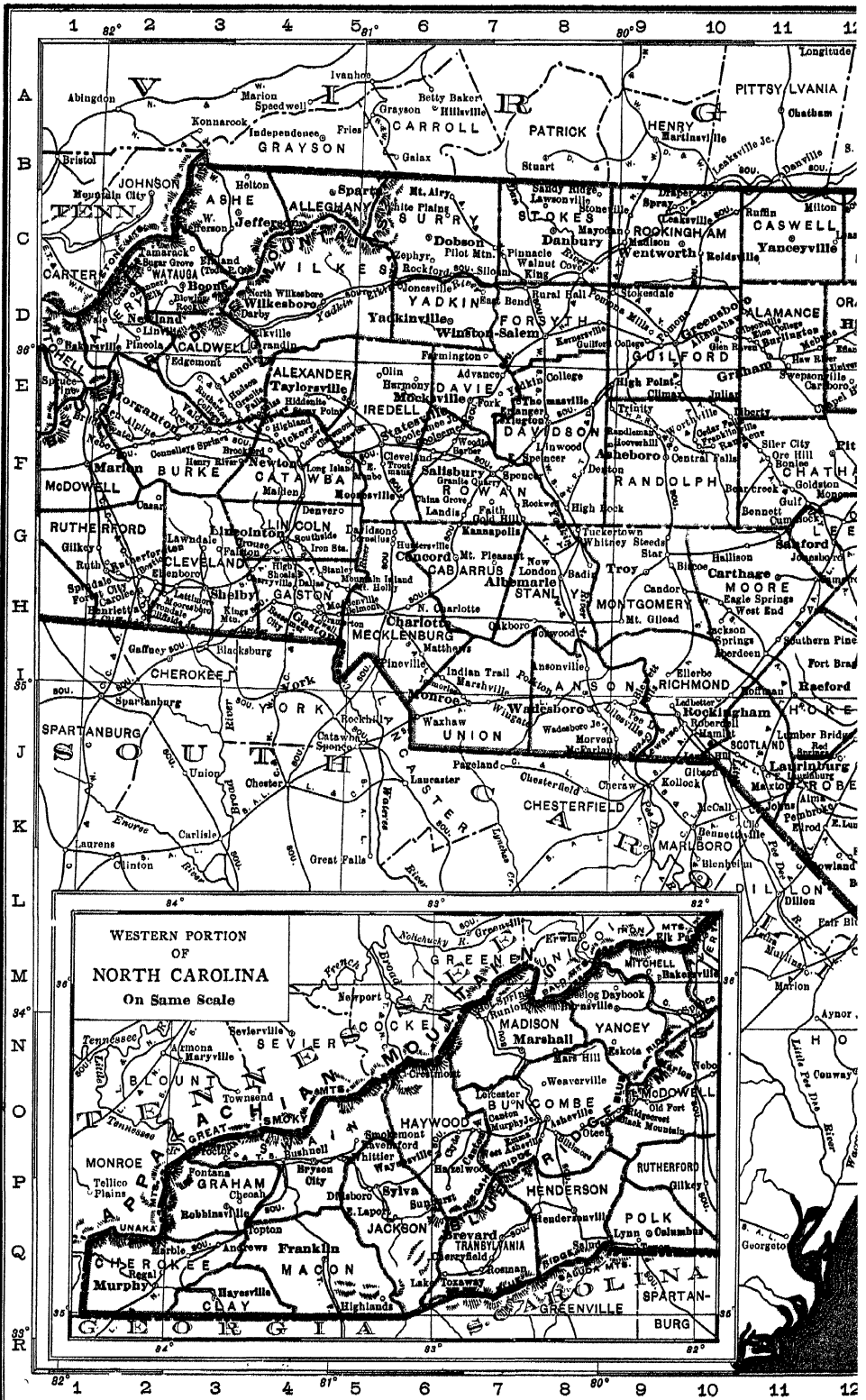
# NORTH CAROLINA

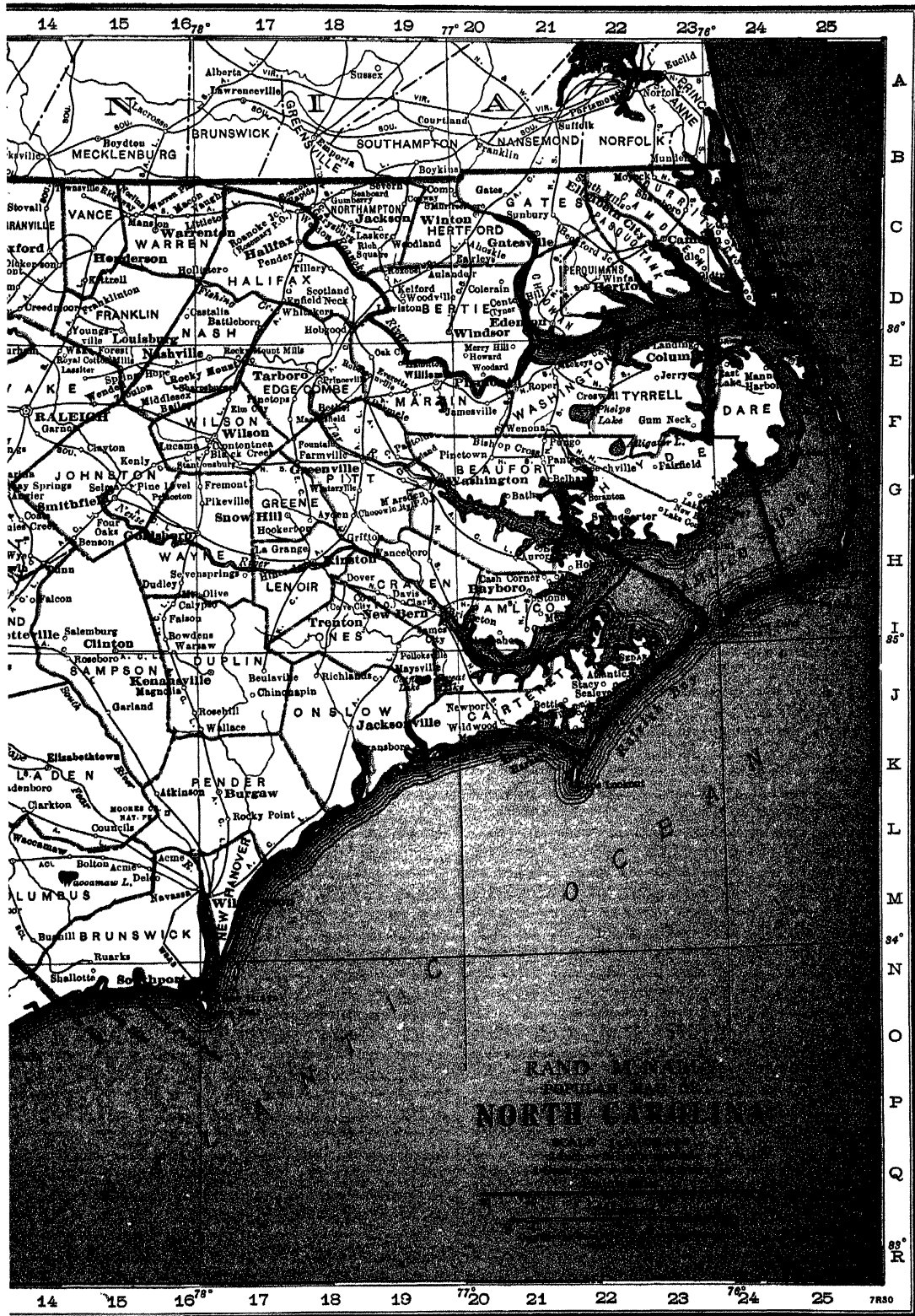
Area, 52,428 sq. m.  
Pop., 3,170,276

## PRINCIPAL CITIES

### Pop.—Thousands

4	Albemarle	H 8
5	Asheboro	F 9
50	Asheville	O 8
3	Baile	H 8
3	Beaufort	J 21
4	Beltmont	H 5
4	Reasemey	H 4
10	Burlington	I 11
6	Canton	E 7
3	Chapel Hill	E 12
83	Charlotte	H 6
3	Cherryville	H 4
3	Ollinton	I 15
12	Concord	G 6
4	Cramerton	E 5
5	Dunn	H 14
53	Durham	E 13
4	Edenton	D 21
10	Elizabeth City	E 22
2	Enfield	D 17
2	Farmville	F 17
13	Fayetteville	I 13
4	Forest City	H 1
17	Gastonia	H 4
2	Gilbertsville	H 10
15	Goldsboro	G 16
2	Granite Falls	E 4
3	Graham	E 11
54	Greensboro	O 10
9	Greenville	H 10
5	Hamlet	J 10
6	Henderson	C 15
5	Hendersonville	P 8
2	Henrietta	P 8
2	Hertford	D 22
7	Hickory	F 4
2	Highland	F 4
37	High Point	E 9
7	Kannapolis	C 7
2	Kernersville	H 8
6	Kings Mountain	H 3
11	Kinston	H 18
3	Laurinburg	J 11
7	Lenoir	E 13
10	Lexington	E 7
4	Lincolnton	G 4
2	Louisburg	D 15
2	Lowell	H 4
4	Lumberton	K 12
2	Madison	C 9
2	Maiden	G 4
2	Marion	F 1
2	Mayodan	C 9
2	McBane	D 12
6	Monroe	E 16
3	Mooreville	F 5
3	Morehead City	K 20
6	Morganton	F 2
6	Mount Airy	B 6
3	Mt. Olive	H 16
12	New Bern	I 19
4	Newton	F 4
4	North Wilkesboro	H 4
4	Oxford	C 14
2	Plymouth	E 20
37	Raleigh	F 14
7	Reidsville	C 10
3	Ronoke	C 17
3	Rockingham	I 10
21	Rocky Mt.	E 16
4	Roxboro	C 13
2	St. Paul	I 13
17	Salisbury	F 6
4	Sanford	G 12
2	Selma	G 15
11	Shelby	H 3
2	Siler City	I 11
3	Smithfield	G 14
3	Southern Pines	H 11
3	Spencer	F 7
3	Spindale	H 1
6	Spray	E 9
11	Statesville	F 6
6	Tarboro	E 17
10	Thomasville	E 8
2	Troy	H 9
2	Tryon	Q 9
2	Valdese	E 3
3	Wadesboro	I 8
7	Washington	G 19
2	Weldon	C 17
2	Whiteville	L 13
3	Williamston	E 19
82	Wilmington	M 16
13	Wilson	M 16
75	Winston-Salem	D 8





A  
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C  
D  
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NORTH CAROLINA



it has a large steel mill. In 1929 the retail business reached a total of \$1,605,644. Gen. Edward Braddock fell in battle near here, July 9, 1755. Pop. 1920, 14,928; 1930, 16,782.

**NORTHBRIDGE**, a town including the villages of Northbridge and Whitinsville, in Worcester Co., southern Massachusetts. The village of Northbridge is situated on the Blackstone River, 16 mi. southeast of Worcester and is served by the New Haven Railroad and by motor buses. The airport is at Whitinsville. The town has numerous factories making chiefly textile machinery, embossed papers, silk and cotton fabrics and spinning rings. Northbridge, once a part of Mendon, was incorporated in 1772. HENRY WARD BEECHER taught at the old Northbridge school house. Near by is Purgatory Chasm State Park. Pop. 1920, 10,174; 1930, 9,713.

**NORTH CAROLINA**, one of the south Atlantic states of the United States, popularly called both the "Old North State" and the "Tar Heel State." It is



NORTH CAROLINA STATE SEAL

situated between 33° 52' and 36° 34' N. lat. and 75° 27' and 84° 20' W. long. The state is bounded on the north by Virginia, on the east and southeast by the Atlantic Ocean, on the south and southwest by South Carolina and Georgia, and on the west and northwest by Tennessee. North Carolina comprises an area of 52,426 sq. mi., inclusive of 3,686 sq.

mi. of water surface, with a maximum length of 503 mi. from east to west and a maximum breadth of 187 mi. from north to south. In size North Carolina ranks twenty-seventh among the states of the Union.

**Surface Features.** The topography of North Carolina is divided into three distinct zones: the Blue Ridge Mountains, the Piedmont Plateau, and the Atlantic Coastal Plain. The latter occupies almost one-half of the state, thereby reducing the mean elevation to 700 ft. above sea level. The maximum altitude is 6,684 ft. on the summit of Mt. Mitchell.

In North Carolina the Blue Ridge Mountains widen into a high plateau from which rise several groups of peaks. Farthest west is the Great Smoky range which comprises the western boundary. East of it are a series of cross ranges including the Cowee, South, Brushy, Unaka and Black mountains, the latter group containing Mt. Mitchell. Other prominent peaks are Clingmans Dome, 6,644 ft., Mt. Guyot, 6,615 ft., the Chimney Tops, 5,800 ft., and Thunderhead, 5,520 ft. These peaks have moderate slopes and rounded summits, and are mostly forested to the top. Between the different mountain groups are beautiful valleys of which the most noted are those of French Broad, Mills, Pigeon and Hiwassee rivers.

The Piedmont Plateau east of the Blue Ridge is 60 to 75 mi. wide. Its most prominent features are a

succession of broad-backed swells with a southeast trend which form the watersheds between a number of large rivers. These, chiefly the Yadkin, Cape Fear, Neuse and Tar, issue from narrow gorges in the mountains and reach the Atlantic through valleys 300 to 500 ft. wide.

The edge of the Piedmont, known as the fall line, descends generally 200 ft. to the coastal plain which is an almost perfect level varying in width from 100 to 150 mi. Swamps and marshes occur along its shoreline. Off-shore is an outer coastline formed by a chain of long, narrow barrier beaches from which project Cape Fear, Cape Lookout and Cape Hatteras. Inside the barrier beaches are sounds of shallow, almost tideless water. The openings to the sounds are constantly shifting. At present the Hatteras inlet is the most reliable entrance to Pamlico Sound, and the Currituck inlet to Albemarle Sound.

**Climate.** Because of its situation within three major provinces, the coastal plain, the Piedmont Plateau and the Appalachian Mountains, North Carolina exhibits considerable variation in climate. At Wilmington, in the coastal plain, the mean annual temperature is 63.1° F. with an average of 46.5° F. for January and 79.1° F. for July; at Charlotte, in the Piedmont Plateau, it is 60.2° F. with an average of 41.2° F. for January and 78.4° F. for July; at Asheville, in the mountains, it is 54.1° F. with an average of 35.4° F. for January and 71.7° F. for July. During the period 1887-1930 the highest temperature recorded in the state was 108° F. and the lowest, —21° F. The average annual precipitation is 50.3 in. including 8.5 in. of snow. At Wilmington the average growing season is 235 days; at Charlotte, 222 days; at Asheville, 188 days.

**Forests and Parks.** Of a total land area of 31,193,600 acres approximately 30,080,000 acres were originally forested. In 1931 the total forested area was 21,056,400 acres of which practically one-half was pine land and the other half hardwoods. It has been estimated that there are 30,000 acres of virgin pine still standing and that not more than 3% of the hardwood area is virgin timber. Long leaf pine and loblolly pine are the characteristic trees of the coastal plain with bald cypress, southern white cedar, and red maple in the extensive swamps of the region. The Lower Piedmont area contains upland pine forests and its valley slopes are covered with deciduous trees chiefly maple, beech and tulip. Oak and hickory forests and stretches of shortleaf and Virginia pine are found in the Upper Piedmont. The slopes of the Blue Ridge Mountains are covered with oak, chestnut and hickory forests and the summits have extensive spruce and fir forests. Four National Forests, Cherokee, Nantahala, Pisgah, and Unaka with a total net area of 389,924 acres, extend into the Blue Ridge region of western North Carolina. These forests contain excellent stands of virgin timber. One of the four divisions of the Pisgah forest is a national game preserve.

Mt. Mitchell, the highest point in the eastern part



of the United States, and Rendezvous Mountain, both in the Blue Ridge, have been made state parks and are developed for camping and other recreational use. Four hundred acres around Ft. Macon, a brick and earthwork fortification built in 1835 which featured in the Civil War, has also been made a state park. It has an excellent beach on the ocean front and is also developed for camping. Guilford Court House and Moores Creek, scenes of important Revolutionary battles, are National Military parks administered by the War Department. KITTY HAWK, scene of the Wright brothers' famous flight, is a National Monument.

**Minerals and Mining.** The mineral resources of North Carolina, although interesting in variety, are of minor commercial importance, the most valuable being quarries of building stone, clay beds, sand and gravel deposits and copper ore. Limited quantities of gold and gemstones are produced.

With mineral productions in 1929 amounting to \$10,963,896, North Carolina stood thirty-seventh among the states, ranking first in feldspar and mica and fourth in granite. The principal products in order of value were stone, 1,607,670 tons, \$3,880,113, including granite, \$3,213,624; clay products, \$3,196,830; copper, about \$1,400,000; sand and gravel, 1,004,858 tons, \$1,020,533; and feldspar, \$952,122. Among products of minor importance were mica, coal, iron ore and talc.

During 1929 129 mines and quarries gave employment to 2,843 persons who received \$2,780,936 in salaries and wages.

**Soil.** The more elevated mountain districts of North Carolina possess a deep clay soil containing some gravel and sand. This soil is most fertile on the northwestern slopes and less rich when overlying slate beds on the southwestern slopes. On the whole this soil becomes more sandy in the Piedmont Plateau region and still more so in the coastal plain district where it is comprised in very large part of sand. However, throughout nearly the entire coastal plain there are deposits of marl which greatly increase fertility of the soil. North of the Neuse River, loam, peat, silt and clay soils are found.

**Agriculture.** In farm products North Carolina ranks among the leading agricultural states. The principal crops include tobacco, cotton, grain, vegetables and fruits.

In 1930 18,055,103 ac. or 57.9% of the entire land area was in farms, 279,708 in number, with an average size per farm of 64.5 ac. and an average value per acre of \$46.75. Of the farm area 7,012,201 ac. or 39% was crop land; 2,845,283 ac. or 16%, pasture land; and 6,902,522 ac. or 38%, woodland. The total value of farm property was \$965,351,505, of which \$844,121,809 was represented by land and buildings; \$42,211,827, by implements and machinery, and \$79,017,869, by domestic animals.

According to the census of 1930 North Carolina produced in 1929 field crops to the value of \$253,844,532, ranking ninth among the states. It stood first in tobacco, second in sweet potatoes, fifth in

cucumbers, sixth in blackberries, seventh in beans, peaches and strawberries, and ninth in cotton and cottonseed. The chief crops were tobacco, 454,222,610 lbs. grown on 685,074 ac. and valued at \$81,714,906; cotton, 764,328 bales grown on 1,640,398 ac., valued at \$63,085,046, together with cottonseed 354,164 tons, \$10,152,135, and grains, \$52,916,024. Other important crops were vegetables, \$29,068,054; hay and forage, 500,741 tons, \$9,796,639, and fruits and nuts \$7,111,728.

The grains included corn 35,608,833 bu., wheat 3,623,003 bu., oats 949,082 bu., rye 414,096 bu. and barley 328,746 bu. Among the vegetables were potatoes valued at \$7,287,251, sweet potatoes \$6,044,936, beans \$787,917, cucumbers \$502,341, watermelons \$470,538 and cabbages \$400,933. The leading fruit and nut crops were apples 2,465,115 bu., peaches 1,325,603 bu., pears 195,862 bu., strawberries 16,460,037 qts., blackberries 1,930,986 qts., grapes 7,435,832 lbs., figs 392,768 lbs. and pecans 407,627 lbs.

Farm products sold by cooperative marketing rose from \$663,227 in 1919 to \$2,906,980 in 1929. Farm machinery and equipment in 1930 included 132,876 automobiles, 18,558 motor trucks, 11,426 tractors, 2,320 electric motors and 4,981 stationary gas engines.

**Animal Industry.** Mule- and cattle-raising are the chief livestock interests. According to the census of 1930 North Carolina ranked twenty-sixth among the states in total value, \$79,017,869, of domestic animals on farms. Among these were mules, 294,308, valued at \$33,946,759; horses, 86,716, \$6,979,339; cattle, 532,631, \$24,045,922; swine, 838,994, \$7,325,446, and sheep, 146,285, \$1,022,860.

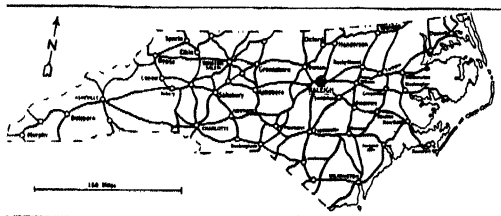
Of the cows on farms, 297,827 were kept mainly for milk production and 21,639 mainly for beef production. In 1929, 119,992,505 gals. of milk were produced; the total value of dairy products sold was \$10,081,813. The value of all poultry raised, chiefly chickens, was \$12,734,414; the chickens sold were valued at \$4,398,881. Of 39,301,116 doz. chicken eggs produced, valued at \$12,361,840, 20,106,567 doz., with a value of \$6,323,191, were marketed. Honey, amounting to 1,292,633 lbs. valued at \$271,806, was produced from 124,218 hives.

**Fisheries.** In 1930, the state ranked fourth in the amount of commercial fish taken, but fifteenth in value of the catch. The amount was 217,595,000 lbs., valued at \$2,544,000. Among the more valuable species are shad, oysters, alewives, herring, squeteague, mullet, butterfish, cod, croaker, scup, sea bass and tilefish. Most of the fishing is done by small boats in Albemarle, Pamlico and Core sounds.

The state issued 29,000 fishing licenses in 1930 and received \$45,527 in fees. Five fish hatcheries costing \$50,000 were operated that year by 9 men. The output included 3,760,000 trout and 150,000 bass. Large plantings were made in 1930 by the U.S. Bureau of Fisheries, including 2,350,000 shad, 10,000,000 glut herring, 240,500 rainbow trout, 150,000 loch leven trout, 126,900 brook trout, 320,075 large mouth black bass, 45,820 sunfish and 2,150,000 yellow perch.

**Transportation.** In 1787, North Carolina and Virginia jointly authorized a canal to join Chesapeake Bay and Albemarle Sound. This waterway, known as Dismal Swamp Canal, was finished in 1794. Work was begun on the state's first railroad, the Raleigh and Gaston line, in 1836. It was completed in 1844 and extended to Weldon in 1852. In 1930 the total steam railway mileage was 5,189. The principal systems are the Southern, the Atlantic Coast Line, the Norfolk and Southern and the Seaboard Air Line. A number of the rivers are navigable through the coastal plain for light-draught boats, and are of local commercial importance. The port of Wilmington affords communication with the Atlantic and Gulf coasts.

Since 1920 the state has made rapid progress in developing an efficient highway system. On Jan. 1, 1930 there were 101,178 mi. of highways, including



NORTH CAROLINA STATE ROADS

29,649 mi. of surfaced roads and 7,333 mi. of improved state highways. Gasoline consumption during 1930 amounted to 250,669,000 gals. The total highway expenditure during 1929 was \$37,541,090, of which \$20,682,110 was paid by the state and \$16,855,980 by county and local governments. The state gasoline tax produced an income of \$12,533,454 in 1930 as against \$7,786,473 in 1926. Total motor vehicle registrations in 1930 were 453,241, compared with 340,287 in 1925. The rapid growth of trucking facilities is indicated by truck registrations, which rose from 28,903 in 1925 to 56,108 in 1930, almost 100%. During the same period, the number of buses in operation increased from 2,800 to 4,513, over 60%.

**Manufactures.** The preeminence of North Carolina in the manufacture of tobacco and cotton goods, in which it leads the nation, has resulted largely from favorable climate and abundant raw material, cheap labor and hydro-electric power. The minor manufacturing industries, likewise, are based chiefly on the state's mineral, forest and agricultural resources.

According to the Census of 1930 North Carolina with manufactures for 1929 valued at \$1,311,924,352 stood fourteenth among the states. Its 3,797 establishments gave employment to 16,599 officers and employees, who received \$37,942,407 in salaries, and to 209,826 wage earners, who were paid \$160,867,988 in wages. These factories used a total of 839,945 horse power, expended \$22,690,076 for fuel and power, and \$596,221,614 for materials and supplies, and added by the process of manufacture \$693,012,662 to the value of their output.

In this output there were 65 separately enumerated

industries in which the state ranked first in tobacco products and cotton goods, third in fertilizers and knit goods, eighth in cottonseed oil, ninth in leather, and tenth in lumber. The two outstanding productions, cigars and cigarettes, valued at \$480,038,850, and cotton goods, \$317,005,212, comprised 60% of the state's entire factory output. Other important products in order of value were: knit goods, \$86,112,765; furniture, \$56,737,489; lumber and timber products, \$39,360,383; fertilizers, \$22,956,326; silk and rayon, \$18,587,608; planing mill products, \$18,279,171; leather, \$18,017,395, and cottonseed oil, \$16,990,715.

The leading manufacturing cities, with value of output, were Winston-Salem, \$291,161,279, and Durham, \$137,645,909, both devoted largely to the tobacco industry. Next in importance, with chief product and value of total output, were Charlotte, cotton goods, \$57,915,679; High Point, furniture, \$52,185,880, and Greensboro, tobacco, \$38,782,076. Cotton manufacture is centered mostly in smaller places on or near the "fall line," where water or hydro-electric power is available.

**Commerce.** According to the census of 1930, there were in 1929 2,414 wholesaling establishments in North Carolina, with total sales of \$718,467,911. These organizations gave full-time employment to 24,500 men and women whose annual salaries and wages aggregated \$25,833,291. The chief wholesaling center is Charlotte, with Durham and Greensboro also important.

The total sales of the 28,958 retail stores amounted to \$744,136,243. Sales per store averaged \$25,697; sales per capita were \$234.72.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
General Mdse. ....	6,075	\$274,141,462	36.84
Automotive ....	5,867	136,980,596	18.40
Food .....	9,079	133,403,065	17.93
Apparel .....	1,269	38,272,036	5.13
Lumber & Bldg. ...	721	34,157,727	4.60
Furn. & Household ..	740	28,740,396	3.86
All other stores ....	5,207	98,440,961	13.24
Total, all stores		\$744,136,243	100.00

Wilmington, the principal port, handled waterborne commerce amounting to 1,218,760 tons, with a value of \$62,281,208.

**Finance and Banking.** The assessed value of all taxable property in 1929 was \$2,971,338,814. The total debt, which was \$178,064,600 in 1930, was distributed between highway bonds, \$107,949,600, education and charitable institutions, \$44,280,000, public schools, \$16,585,000 and World War veterans, \$2,000,000. Total revenues in 1928 were \$43,079,901; total expenditures, \$47,349,141. The chief sources of income were property taxes, \$9,890,000, income, insurance and public utility taxes and licenses. This latter item included motor vehicle taxes, and gasoline taxes of \$9,678,519. The principal payments were for highways, \$20,518,560, educational aid, \$3,542,940 and other permanent improvements, \$3,329,677.

There were 436 banks in North Carolina in 1930. Of these, 57 were national banks, 378 trust companies and state banks and 1 private bank. Their total capitalization was \$34,278,715; their surplus and undivided profits, \$31,671,000. Total resources were \$448,554,000, with loans and discounts aggregating \$298,682,000. Demand and time deposits totaled \$315,391,000. Per capita demand and time deposits were \$99.02; per capita savings deposits, \$45.61. The total savings of \$145,271,000 were owned by 429,425 depositors. National bank circulation aggregated \$6,993,000.

**Government.** The legislative body consists of a general assembly composed of a Senate of 50 members and a House of Representatives of 120 members, all elected for terms of two years. They meet in biennial sessions limited in duration to 60 days. The chief executive is the governor elected for a term of four years at a salary of \$6,500 per annum. He has no veto and but little appointive power. Other executive officers are the lieutenant governor, secretary of state, auditor, treasurer, superintendent of public instruction and attorney-general. Judicial power is vested in a supreme court, superior courts, district courts, and in justices of the peace. The supreme court consists of 5 judges elected for terms of eight years at salaries of \$6,000 per annum.

**Social Welfare Institutions.** There is a State Board of Charities and Public Welfare. The Caswell Training School for men defectives is at Kinston, a manual training school for delinquents at Concord, an industrial school for delinquent boys at Rocky Mount, an industrial farm colony for delinquent women at Kinston, and a training school for Negro juvenile delinquents at Hoffman. A school for blind whites is at West Raleigh and the colored department at East Raleigh. The school for the colored deaf is also at East Raleigh. The school for the white deaf is at Morganton. At Samarcand is a home and industrial school for neglected and wayward girls. An orthopedic hospital for crippled children is located at Gastonia, a tuberculosis sanitarium at Sanatorium, hospitals for white insane at Raleigh and Morganton and for Negro insane at Goldsboro. Orphanages are maintained at Oxford for Negroes and whites, a soldiers' home at Raleigh, and a Confederate women's home at Fayetteville. The state prison is at Raleigh.

**Education.** The first school was established in Pasquotauk Co., in 1705 by Charles Griffin, and 7 years later a school was opened at Sarum. Academies were established at Wilmington in 1760, at Newbern in 1764, and elsewhere before the Revolution. Separate schools are provided for white, colored and Indian children. In 1928 there were 6,279 public school buildings. The public kindergarten and elementary schools in 1927-28 had 746,375 pupils, and the public secondary schools, 102,647 pupils. Children 8 to 12 years of age are required to attend school 4 months of the year.

The number of persons from 5 to 20 years of age attending school in 1930 was 796,426, or 64.4% of the

population within the ages specified, as compared with 620,486, or 62.7%, in 1920. The number of persons, 10 years and over, unable to read and write in 1930 was 236,261, or 10%, as compared with 241,603, or 13.1% in 1920. Native white illiterates numbered 93,372 or 5.6%, in 1930; and 104,844, or 8.2%, in 1920. Negro illiterates numbered 139,105, or 20.6%, in 1930; and 133,674, or 24.5%, in 1920.

Among the state institutions of higher learning are the University of North Carolina at Chapel Hill, the North Carolina College of Agriculture and Engineering at Raleigh, the North Carolina College for Women at Greensboro, the East Carolina Teachers' College at Greenville, and normal schools at Cullowhee and Boone. For Negroes the state maintains the Negro Agricultural and Technical College at Winston-Salem, the North Carolina College for Negroes at Durham, and normal schools at Fayetteville and Elizabeth City. There is a state school for Indians at Pembroke. Other educational institutions include Duke University at Durham, Wake Forest College at Wake Forest, Davidson College at Davidson, and for Negroes, Shaw University at Raleigh, Johnson C. Smith University at Charlotte and Livingston University at Salisbury. The North Carolina Library Commission has headquarters at Raleigh.

**Population.** In 1930 North Carolina ranked twelfth among the states with a population of 3,170,276 or an average of 65.0 per sq. mi., an increase of 611,153 or 23.9% over 1920. The population rose from 393,751 in 1790 to 992,622 in 1860, 1,893,810 in 1900, 2,206,287 in 1910, and 2,559,123 in 1920. In 1930 there were 2,234,948 or 70.5% whites, 918,647 or 29.0% Negroes, and 16,579 or 0.5% Indians, an increase from 1920 of 25.3% whites and 20.3% Negroes. Of the whites, 2,226,160 were native-born and 8,788 were foreign-born. The rural population was 2,360,429 or 74.5% of the total, an increase of 291,676 or 14.1% from 1920; the urban population was 809,847 or 25.5% of the total, an increase of 319,477 or 65.2% since 1920. In 1930 the five largest cities were Charlotte, 82,675; Winston-Salem, 75,274; Greensboro, 53,569; Durham, 52,037; Asheville, 50,193.

**Occupations.** In 1930 1,140,971 persons, or 36% of the population, were gainful workers 10 years old or older; 76.1% of these were males and 23.9% were females; 67% were native white; 0.5% were foreign-born white; 32% Negro, and 0.5% other races. In agriculture, the principal occupation, 499,957 persons were engaged; of these 270,087 were farmers, and 93,901 farm wage workers. Among other important occupations, with number of workers, were manufacturing, 290,719, including 188,933 factory operatives and laborers, of which 76,818 were engaged in cotton mills, 19,756 in tobacco factories, and 17,385 in knitting mills, domestic and personal service, 103,451; trade, 87,476, including 26,812 retail dealers and 29,226 salespersons; professional service, 51,993, including 24,322 school teachers, 4,030 men and 20,292 women; transportation and communication, 50,564, and clerical service, 33,352.

## HISTORY

Sir WALTER RALEIGH, recipient of a grant for colonization of the New World from Queen Elizabeth, despatched an exploring expedition which arrived at Wokoken Inlet on July 4, 1584, to return with glowing reports. In 1585 Raleigh sent out an expedition of seven ships, Sir Richard Grenville commanding, which settled 108 colonists on Roanoke Island under Gov. Ralph Lane; other colonists arrived later. Between 1587 and 1591 the settlement vanished, its fate an unexplained mystery. After having been granted by Charles I to Sir Robert Heath in 1629, and forfeited, Carolina was bestowed by Charles II upon eight court favorites in 1663. The northern section was first settled by Virginia "squatters"; Albemarle, founded about 1660, on the Chowan River, was the first permanent white settlement in Carolina. Wilderness separated the Cape Fear region from the settlements in SOUTH CAROLINA; the division was recognized by the appointment of a deputy executive for the northern settlements, until in 1710 Edward Hyde arrived as the first governor of North Carolina. The work of defining the boundary between the two Carolinas, begun in 1732, was not satisfactorily completed until 1815. The TUSCARORA WAR broke the power of the Indians. When Edward Teach, the famous pirate, was killed in 1718, the menace of piracy was practically ended. The first legislature had convened at Albemarle in 1665; its successors were persistently intractable, from the proprietors' point of view. In 1728 North Carolina became a crown colony; but Earl Granville retained the land rights to a strip 70 miles wide along the VIRGINIA boundary, which line was surveyed in that same year to end a controversy of long standing.

Tobacco plantations near the coast and later in the Piedmont, and small clearings and cattle-pens in the backwoods were characteristics of the colonial scene. Steady accretions of population—British, Scotch-Irish, Highlanders, Swiss, Moravians, Huguenots and negro slaves—brought the number of inhabitants to approximately 300,000 at the close of the colonial period. The REGULATION was an extreme manifestation of backwoods democracy; but the colony as a whole supported the Revolutionary movement. (See MECKLENBURG DECLARATION OF INDEPENDENCE.) A state constitution was adopted on Dec. 18, 1776. North Carolina was twice invaded by British troops, in 1776 and in 1780-1781 (see REVOLUTIONARY WAR). The federal Constitution was ratified, after a first convention at Hillsboro had declared itself unwilling unless a BILL OF RIGHTS was added, by a convention, at Fayetteville on Nov. 13, 1789. The state's trans-Appalachian lands were ceded to the national Government in 1790 (see TENNESSEE). The capital was fixed at Raleigh in 1792. The leading issue in state politics until 1835 was the demand of the western counties for adequate representation. North Carolina favored compromise in the slavery controversy, and was reluctant to secede; while the Confederacy was ably supported, Gov. Zebulon B. Vance cham-

pioned STATES RIGHTS against the encroachments of the Confederate government. Reconstruction was a harassing experience; but in time, partly because of the phenomenal increase of manufactures within the state, politics became bi-partisan. The most notable Republican victory was the casting of the state's electoral vote for Hoover in 1928; a significant aftermath, however, was the crushing defeat of Sen. Simmons, who had abandoned his party's ticket to support Hoover, when he sought renomination in 1930. In 1932 the state returned to the Democratic standard and gave its 13 electoral votes to Franklin D. Roosevelt. Robert R. Reynolds, Democrat, was elected to the Senate and John C. B. Ehringhaus, also a Democrat, received the governorship.

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**NORTH CAROLINA, UNIVERSITY OF**, at Chapel Hill, N.C., a state-owned and controlled institution, organized in 1793. During the Civil War the university met with severe losses and had to be closed, but was reopened in 1875. The university comprises schools and colleges of Liberal Arts, Applied Sciences, Education, Commerce, Graduate School, Law, Medicine, Pharmacy, Engineering, Public Welfare, Institution of Research in Social Science, Summer School and Extension Division. Women are admitted to the two higher classes, to the professional schools and as special students. The institution had productive funds in 1931 amounting to \$2,137,648. The library contained 205,000 volumes. In 1930 there was a student enrollment of 3,266, with a faculty of 217 headed by Pres. FRANK P. GRAHAM.

**NORTH CAROLINA COLLEGE FOR WOMEN**, at Greensboro, N.C., was established in 1892. It is supported by legislative appropriation. The productive funds in 1931 totaled \$1,023,501. The library contained 58,973 volumes. In 1931-32 there were 1,676 students enrolled and a faculty of 162, headed by Pres. JULIUS I. FOUST.

**NORTH CHANNEL**, a strait of the Atlantic Ocean between the extreme southwest of Scotland and the extreme southeast of Ireland. Its length from the Atlantic on the north to the Irish Sea on the south is about 80 mi.; in some places it is only 14 mi. wide. Owing to a strong current in the channel navigation between Stranraer and Belfast is difficult.

**NORTH CHICAGO**, a city in Lake Co., north-eastern Illinois, situated on Lake Michigan 35 mi. north of Chicago and served by three railroads. The city is a manufacturing center producing chemicals, pressed steel and brass products, spring bumpers and electrical supplies. Adjoining to the south is the Great Lakes Naval Training Station. Pop. 1920, 5,839; 1930, 8,466.

**NORTHCLIFFE, ALFRED CHARLES WILLIAM HARMSWORTH, LORD** (1865-1922), British newspaper publisher, born at Dublin, July 15, 1865. Moving to London in 1867 he entered journalism. He started (1888) "Answers to Correspond-

dents," a weekly, and subsequently directed many publications that revolutionized the newspaper business. He had a great belief in the future of the automobile and the aeroplane. He long advocated more friendly relations between England and Germany, but after the Boer War was less sanguine. During the World War he was a bold commentator, criticizing Kitchener (1915) in a way that aroused indignation. Northcliffe visited the battle-fronts, and in 1917 came on a special mission to New York, but declined the British ambassadorship to Washington. Owing to ill-health, he toured the world in 1921. He died at London, England, Aug. 14, 1922.

**NORTH DAKOTA**, one of the north central states of the United States, popularly called the "Sioux State." It is situated between 45° 55' and 49° N. lat.



NORTH DAKOTA STATE SEAL

and 96° 25' and 104° 3' W. long. The state is bounded on the north by Saskatchewan and Manitoba, provinces of Canada, on the east by Minnesota, on the south by South Dakota, and on the west by Montana. Save for the Red River boundary, separating the state from Minnesota, the boundaries are artificial. North Dakota

comprises an area of 70,837 sq. mi., inclusive of 654 sq. mi. of water surface. In size North Dakota ranks sixteenth among the states of the Union.

**Surface Features.** North Dakota is almost equally divided between two main topographical regions, the Great Plains and the central lowlands. Within the state these regions are separated by a well defined escarpment known as the break in the plains, which crosses the southern boundary about 60 mi. east of the Missouri River and follows the curve of that river at about the same distance to the northwestern corner.

The features of the section east of this scarp are due mostly to glacial action. There are terminal moraines in the form of ranges of blunt hills and numerous lakes without outlets. Devils Lake on the boundary between Benson and Ramsey counties was formed by the damming of a former river valley. The eastern tier of counties is a practically flat plain which was once covered by a sheet of water known as Lake Agassiz. The lake has diminished to the Red River of the North but its ancient shore line still exists in a ridge called the Manitoba escarpment.

The southwestern half of the state belongs to the Missouri plateau, a subdivision of the Great Plains. The area between the Missouri River and the break in the plains is an upland surmounted by ranges of moraines, which is called the Missouri Coteau. That part south and west of the Missouri River is a rough, unglaciated area dissected by many streams. Paralleling the course of the Little Missouri River is a belt of bad land formations consisting of flat-topped buttes

and monadnocks rising to 400 and 600 ft. above the general level. Black Butte, 3,468 ft. above sea level, in Slope Co., is the highest point in the state. Sentinel Butte in Golden Valley Co. rises to 2,711 ft. The mean elevation of the state is 1,900 ft., and the lowest point, 790 ft., occurs in Pembina Co.

Two river systems serve North Dakota. The Missouri meanders through a trough 300 to 400 ft. deep and with its tributary, the James, drains two-thirds of the state. The remainder is drained by the Red River of the North into Hudson Bay.

**Climate.** North Dakota enjoys an equable climate. The extremes in temperature are alleviated by the dryness of the air. The mean annual temperature for the state is 38.8° F. At Bismarck the average for January is 7.8° F. and for July, 69.8° F. During the period 1892-1930 the highest temperature recorded in North Dakota was 124° F. and the lowest, -56° F. The average annual precipitation is 17.9 in. At Bismarck the average date of the last killing frost in spring is May 11 and that of the first killing frost in autumn is September 20, giving an average growing season of 132 days.

**Forests and Parks.** Slightly more than 1% or approximately 510,522 acres of the land area of North Dakota is forested. The original forest cover was only 640,000 acres. Except where planted by farmers, trees are found only in the Turtle Mountains, the Pembina Mountains, the region surrounding Devils Lake and in the bottomlands along the Missouri and Red rivers. Among the few trees native to North Dakota the most important are cottonwood, paper birch, soft maple, basswood, green ash, American elm, box elder, bur oak and a few species of willow. Western yellow pine, the only pine native to the state, is found only in Slope Co.; red cedar, native to the Missouri bottomlands and the Badlands has been mostly cut for fence posts. Exotics from China, Siberia, Japan and other foreign parts have been introduced in the search for trees adapted to this semi-arid region. The state cooperates with the Federal Government under the Clarke-McNary Law and in 1930 177,100 trees raised at the State Forest Nursery at Bottineau were planted solely for shelter belts and windbreaks. For similar purposes the Northern State Plains Field Station at Mandan has been distributing free trees to farmers since 1915. North Dakota has a system of 25 state parks which have been developed to preserve historical sites and to serve as community centers for the use of the residents of the adjacent regions. Sections of these parks are game preserves. Verendrye National Monument is located in North Dakota.

**Minerals and Mining.** The mineral resources of North Dakota, thus far utilized, are of minor importance. There are, however, readily workable deposits of lignite coal, which cover an area of some 30,000 sq. mi. in the western part of the state. The lignite obtained from these beds, sometimes 8 ft. thick, constitutes about 90% of the state's mineral output. Besides the coal fields, there are valuable clay deposits.

With mineral productions in 1929 amounting to \$3,465,563, North Dakota stood forty-fifth among the states. The principal items were lignite, 1,862,130 tons valued at \$3,157,000; clay products, \$174,892, and sand and gravel, \$133,621.

**Soil.** The rich black loams of the Red River valley are the most fertile soils in the state and are especially adapted to the production of wheat. Comprising the basin of old Lake Agassiz, this valley is one of the richest tracts of agricultural land in the United States. West of this valley the soils of North Dakota are composed chiefly of glacial drift but in the extreme west they consist of admixtures of sand and clay. An extensive acreage of grain is grown on the fertile drift soils. Where the water supply is sufficient the clays and sands in the western districts are productive. Parts of western North Dakota, however, are semiarid with soils suitable only for grazing.

**Agriculture.** The production of grain, especially wheat, is the chief agricultural interest.

In 1930 38,657,894 ac. or 86.1% of the entire land area was in farms, 77,975 in number, with an average size per farm of 495.8 ac. and an average value per acre of \$24.61. Of the farm area 24,528,120 ac. or 63% was crop land and 10,758,599 ac. or 28% pasture land. The total value of farm property was \$1,186,658,860, of which \$951,225,446 was represented by land and buildings; \$118,743,521, by implements and machinery; and \$116,689,893, by domestic animals.

According to the census of 1930 North Dakota produced in 1929 field crops to the value of \$181,303,144, ranking twenty-first among the states. It stood first in rye and flax, second in wheat and barley and tenth in oats. The chief crops were grains, \$152,644,144; hay, 2,362,585 tons, \$19,509,883, of which wild grasses contributed about half, and potatoes, \$7,647,247. The acreage and yield of the grain crops were wheat 9,969,370 ac., 95,574,408 bu.; barley, 2,834,949 ac., 38,154,988 bu.; oats, 1,735,461 ac., 31,174,936 bu.; rye, 949,050 ac., 9,053,338 bu.; flaxseed, 1,338,961 ac., 5,616,087 bu., and corn, 137,796 ac., 2,172,643 bu.

Farm products sold by cooperative marketing dropped from \$24,484,558 in 1919 to \$20,830,641 in 1929, and farm supplies purchased by this method, from \$3,840,811 to \$1,622,265. Farm machinery and equipment in 1930 included 78,798 automobiles, 16,990 motor trucks, 37,605 tractors, 4,878 electric motors, and 44,165 stationary gas engines.

**Irrigation.** Between 1905 and 1910 irrigation was developed to a limited extent in the valley of the Missouri River in Williams and McKenzie counties on the Montana border. According to the Census of 1930 these counties contained three-fourths of the state's irrigated acreage.

The total number of irrigated farms was 113, with an aggregate area of 56,654 ac., of which 9,392 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$1,304,150, or an average of \$23.02 per ac. The total investment in irrigation enterprises to 1930 was \$1,267,314 and the average

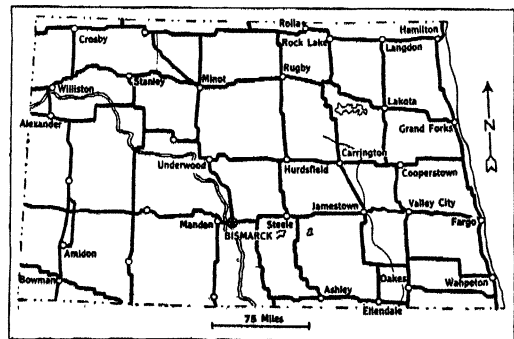
cost of maintenance and operation for 1929 was \$1.97 per ac.

**Animal Industry.** Dairying is the chief livestock interest. According to the census of 1930, North Dakota ranked nineteenth among the states in total value, \$116,689,893, of domestic animals. Among these were 1,454,146 cattle reported from 70,149 farms or 90% of all the farms in the state and valued at \$66,315,121; horses, 612,058 in number valued at \$31,317,750; mules, 7,782, \$444,203; swine, 628,070, \$8,243,608, and sheep, 856,621, \$7,023,726.

Of the cows on farms, 582,612 were kept mainly for milk production and 137,905 mainly for beef production. In 1929 227,819,411 gals. of milk were produced; the total value of dairy products marketed, mostly cream, was \$23,944,839. The value of all poultry raised was \$9,534,559, the number and value of the chief kinds were chickens, 8,176,575, \$5,293,022; turkeys, 1,457,930, \$3,781,679; ducks, 289,041, \$248,842, and geese, 134,729, \$211,016. The chickens sold, 2,662,284 in number, were valued at \$1,828,101. Of 27,888,607 doz. chicken eggs produced, valued at \$6,700,518, 14,605,542 doz., with a value of \$3,508,445, were marketed. The wool clip, 5,246,862 lbs., was valued at \$1,471,601. Honey, amounting to 1,492,597 lbs. valued at \$180,241, was produced from 15,993 hives.

**Fisheries.** There are no commercial fisheries in the state and the streams and lakes offer little fishing for sport. The state issued only 3,429 fishing licenses in 1930, and spent only \$5,420 in fish propagation work. Game fish to the number of 15,000,000 were planted by the state authorities in 1930.

**Transportation.** There are no navigable waterways in the state. The entire length of North Dakota from east to west is traversed by two transcontinental lines, the Northern Pacific and the Great Northern. The Chicago, Milwaukee and St. Paul and the St. Paul and Sault Ste. Marie complete the rail systems which form an efficient transportation network. In 1930 the total steam railway mileage was 5,276.



NORTH DAKOTA STATE ROADS

The state highway system has been well-maintained and extended. The total highway mileage, including the principal through routes, was 110,442 on Jan. 1, 1930, including 3,592 mi. of surfaced roads and 2,823

mi. of improved state highways. Highway expenditures during 1929 were \$9,071,322, of which the state paid \$4,129,072 and county and local governments \$4,942,250. The state gasoline tax produced an income of \$1,971,986 in 1930 as against \$988,493 in 1926. Motor vehicle registrations were 183,019 in 1930, compared with 144,972 in 1925. The rapid growth of transportation by truck is indicated by registrations, which rose from 11,181 in 1925 to 27,636 in 1930, or nearly 150%.

**Manufactures.** As the interests of the state are almost wholly agricultural, manufactures have been but slightly developed. According to the Census of 1930 North Dakota with manufactures for 1929 valued at \$55,321,592 stood forty-sixth among the states. Its 373 establishments gave employment to 993 officers and employees, who received \$2,074,697 in salaries, and to 4,024 wage earners, who were paid \$5,687,028 in wages. These factories used a total of 19,756 horse power, expended \$1,115,528 for fuel and power, and \$38,568,934 for materials and supplies, and added by the process of manufacture \$15,637,130 to the value of their output.

In this output there were 14 separately enumerated groups of manufactures, the most important of which in order of value were butter, \$18,004,541; flour, \$9,812,250; printing and publishing, \$3,880,169, and bread and bakery products, \$3,487,367. The chief manufacturing cities with amount of output were: Grand Forks, \$9,302,913; Fargo, \$6,927,291, and Minot, \$4,907,667.

**Commerce.** According to the census of 1930, there were in 1929 2,619 wholesaling establishments in North Dakota, with total sales of \$262,164,829. These organizations gave full-time employment to 5,936 men and women, whose annual salaries and wages aggregated \$9,943,214. The total sales of the 8,131 retail stores amounted to \$232,810,584. Sales per store averaged \$28,632; sales per capita were \$341.94.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive	1,588	\$57,164,443	24.56
General Mdse. ....	1,282	54,256,321	23.51
Food .....	1,336	31,165,691	13.38
Lumber & Bldg. ..	923	26,077,630	11.19
Apparel .....	381	9,100,280	3.92
Furn. & Household	210	6,245,594	2.68
All other stores ...	2,411	48,800,625	21.06
Total, all stores .	8,131	\$232,810,484	

**Finance and Banking.** The assessed value of all taxable property in 1930 was \$1,000,506,117. The total bonded debt was \$39,358,200, less a sinking fund of \$3,341,730. Total state revenues for 1930 were \$11,987,988; total expenditures, \$12,392,849. The largest sources of income were taxes on motor vehicles, \$2,047,224, gasoline, \$2,030,000 and general property, \$2,552,204. Fees and licenses produced \$1,659,802 while Federal road aid amounted to \$1,310,995. The principal payments were for highways, \$5,235,675, education, \$3,283,055 and charities, \$1,686,091.

There were 318 banks in North Dakota in 1930. Of these, 104 were national banks and 214 trust companies and state banks. Their total capitalization was \$11,135,500; their surplus and undivided profits, \$7,048,000. Total resources were \$128,428,000, with loans and discounts aggregating \$72,734,000. Demand and time deposits totaled \$103,612,000. Per capita demand and time deposits were \$152.37; per capita savings deposits, \$80.09. The total savings of \$54,460,000 were owned by 71,058 depositors. National bank circulation aggregated \$2,899,000.

**Government.** The legislative body of North Dakota consists of a Senate composed of 49 members and a House of Representatives of 113 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 60 days. The chief executive is the governor elected for a term of two years at a salary of \$5,000 per annum. Other executive officers are the lieutenant governor, secretary of state, auditor, treasurer, superintendent of public instruction, commissioner of insurance, three railroad commissioners, an attorney-general, and a commissioner of agriculture and labor. Judicial power is vested in a supreme court, district courts, probate or county courts, and in justices of the peace. The supreme court consists of five judges elected for terms of six years at salaries of \$5,500 per annum.

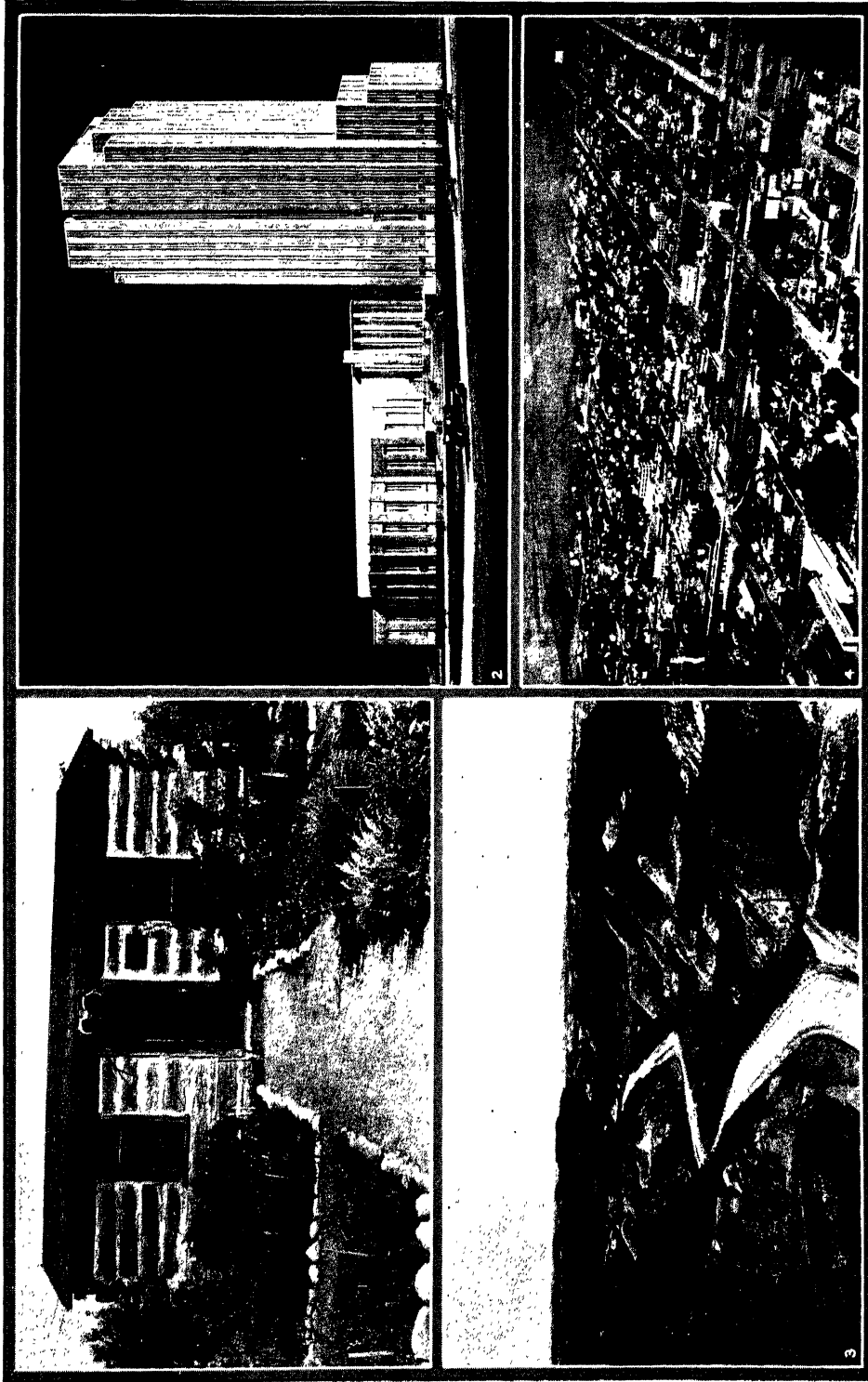
**Social Welfare Institutions.** The State Board of Administration controls the following institutions: School for the deaf at Devils Lake, school for the blind at Bathgate, a tuberculosis sanitarium at Sun Haven, institute for feeble-minded at Grafton, hospital for insane at Jamestown, a training school at Mandan, and penitentiary at Bismarck. The State Children's Bureau looks after all matters concerning child welfare including homes for adoption, labor laws, maternity welfare, children's courts, and the like. The Florence Crittenden Home at Fargo is a shelter for poor girls in distress. There is a soldiers' home at Lisbon.

**Education.** The first school law was passed when the first Dakota legislature met in 1862. Indian massacres and the outbreak of 1862 left Yankton, now in South Dakota, the only settlement in the territory. In 1865 there were 4 legally organized school districts and a few private schools. Eight years later out of a total school population of 5,312 in the territory there were 100 schools with an attendance of 2,006. In 1883, after the territory had been divided into North and South Dakota, the school law was completely revised. There were 5,140 public school buildings in 1928. The public kindergarten and elementary schools in 1927-28 had 145,719 pupils, and the public secondary schools, 27,251 pupils. Children from 8 to 15 years of age are required by law to attend school the full year.

The number of persons from 5 to 20 years of age attending school in 1930 was 175,938, or 71.2% of the population within the ages specified, as compared with 158,259 or 67.9%, in 1920. The number of persons 10 years and over unable to read and write



# NORTH DAKOTA



COURTESY COMMISSIONER OF IMMIGRATION, BISMARCK, N. D.

## NORTH DAKOTA BAD LANDS AND SCENES IN THE CAPITAL CITY

1. Theodore Roosevelt's cabin, now on the State Capitol grounds at Bismarck, formerly on Roosevelt's ranch on the Little Missouri River in Billings County; for three years in the 'eighties the President lived a ranchman's life in North Dakota.
2. Architect's rendering of the new State Capitol. Bell, De Remer and W. F. Kurke, Architects.
3. Federal Highway 10 winding through the Bad Lands in the western part of the state near Medora.
4. Air view of Bismarck; in the upper right are the old State Capitol and the Memorial Building.







# NORTH DAKOTA

Area. 70,837 sq. m.  
Pop. 680,845

## PRINCIPAL CITIES

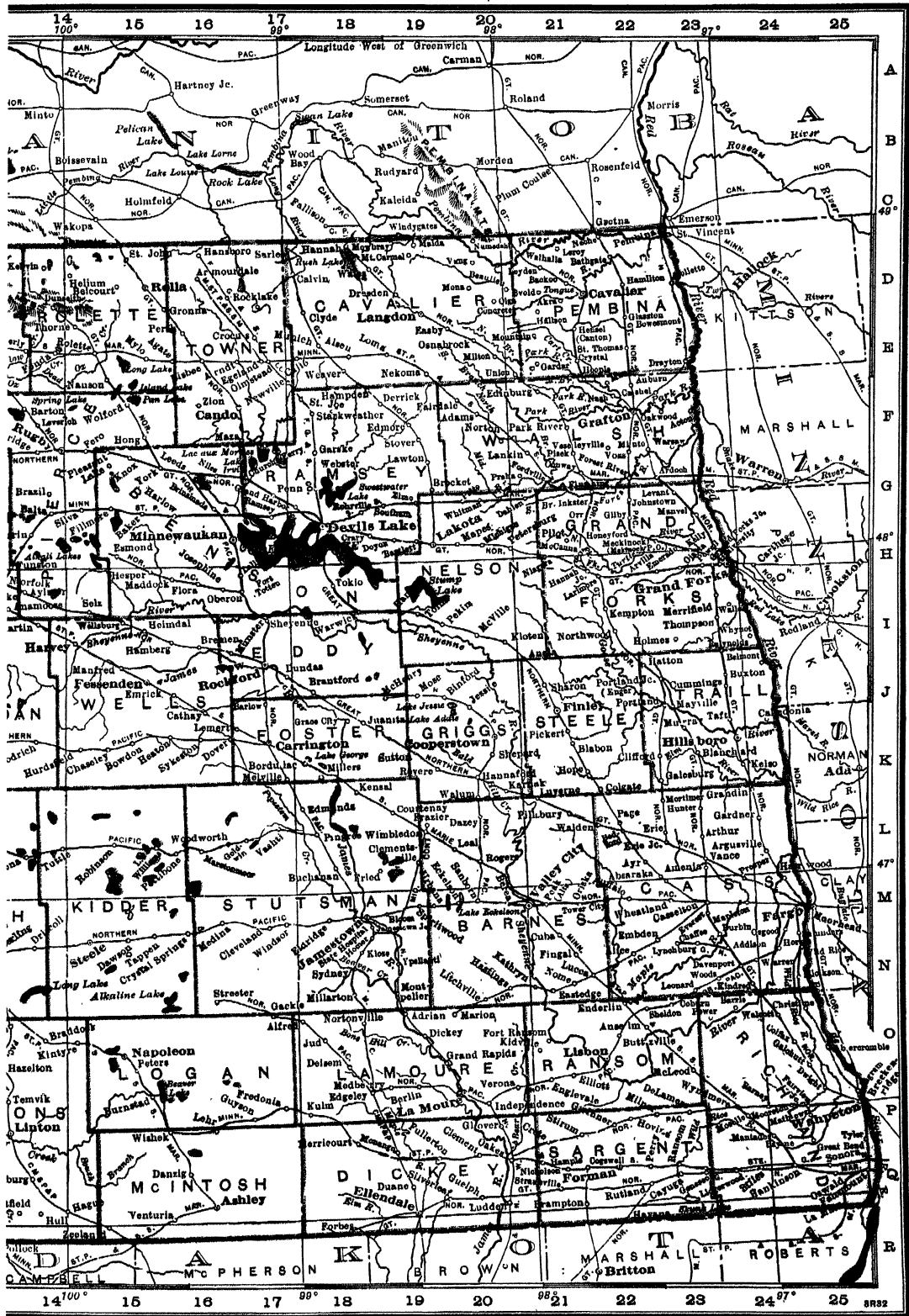
### Pop.—Thousands

- 1 Ashley... Q 16
- 1 Beach... M 1
- 11 Bismarck... N 11
- 1 Bottineau... D 12
- 1 Cando... F 16
- 2 Carrington... K 17
- 1 Casselton... M 23
- 1 Cooperstown... K 20
- 1 Crosby... D 4
- 5 Devils Lake... H 18
- 5 Dickinson... M 6
- 1 Ellendale... Q 19
- 2 Enderlin... Q 22
- 2 Fargo... M 26
- 2 Garrison... M 29
- 1 Glen Ullin... N 8
- 3 Grafton... F 22
- 17 Grand Forks... H 24
- 1 Hankinson... Q 24
- 2 Harvey... Q 14
- 1 Hebron... M 7
- 1 Hettinger... Q 5
- 1 Hillsboro... K 23
- 8 Jamestown... M 18
- 2 Kenmare... B 7
- 1 Langdon... D 19
- 1 Larimore... H 22
- 1 Lidgerwood... Q 24
- 1 Linton... Q 23
- 2 Lisbon... Q 22
- 5 Mandan... N 11
- 1 Mayville... J 23
- 1 Minot... G 10
- 1 Mott... P 6
- 2 New Rockford... I 17
- 1 Northwood... I 22
- 2 Oakes... Q 20
- 1 Park River... F 21
- 2 Rugby... P 14
- 5 Valley City... M 15
- 3 Wahpeton... P 25
- 5 Williston... G 2
- 1 Wilton... L 11
- 1 Wishek... P 15

### Pop.—Hundreds

- 6 Aneta... I 21
- 7 Buford... M 4
- 9 Beulah... L 8
- 7 Bowbells... D 7
- 9 Bowman... P 3
- 9 Cavalier... D 21
- 6 Drake... J 13
- 8 Edgely... P 13
- 6 Fairmount... Q 25
- 7 Fessenden... J 15
- 6 Finley... J 21
- 8 Hatton... J 22
- 7 Hazen... K 9
- 7 Kulm... K 18
- 9 Lakota... H 19
- 9 La Moure... P 19
- 7 Leeds... G 16
- 5 Lehr... K 12
- 7 McCluskey... K 16
- 5 McVie... I 20
- 6 Maddock... H 16
- 7 Marmarth... P 1
- 5 Max... I 10
- 6 Minor... P 22
- 5 Minnewauka... H 16
- 6 Minto... F 22
- 7 Mohall... C 9
- 7 Napoleon... O 15
- 5 Neche... C 21
- 9 New England... O 5
- 8 New Salem... N 9
- 5 Parshall... H 7
- 6 Pembina... C 22
- 6 Portal... C 9
- 6 Portland... J 22
- 1 Ray... F 4
- 1 Richardson... M 6
- 6 Rolla... D 15
- 8 Ryder... D 9
- 8 St. Thomas... D 22
- 1 Sherwood... D 9
- 1 Stanley... G 6
- 1 Steele... N 14
- 1 Strasburg... Q 14
- 1 Streeter... P 16
- 1 Tower... G 13
- 1 Turtle Lake... I 11
- 1 Underwood... K 10
- 1 Velva... H 11
- 7 Wales... D 20
- 7 Walhalla... D 20
- 8 Washburn... K 11
- 1 Watford City... I 4
- 5 Westhope... D 11
- 5 Wildrose... E 4
- 6 Willow City... E 13
- 5 Windmere... P 23







in 1930 was 7,814, or 1.5%, as compared to 9,937, or 2.1%, in 1920. Foreign-born white illiterates in 1930 numbered 4,649, or 4.4%, and in 1920, 7,238, or 5.6%.

Among the institutions for higher education maintained by the state are the University of North Dakota at Grand Forks, the State Agricultural College at Fargo, teachers' colleges at Valley City, Mayville and Minot, and normal schools at Dickinson and Ellendale. Jamestown College at Jamestown and Wesley College at Grand Forks are privately controlled co-educational institutions. The State Library Commission has its headquarters in the Capitol at Bismarck.

**Population.** In 1930 North Dakota ranked thirty-eighth among the states with a population of 680,845 or an average of 9.7 per sq. mi., an increase of 33,973 or 5.3% over 1920. The population rose from 190,938 in 1890 to 319,146 in 1900, 577,056 in 1910, and 646,872 in 1920. In 1930 there were 671,243 or 98.6% whites, 8,387 or 1.2% Indians, and 377 or 0.1% Negroes. Of the whites, 566,095 were native-born; 105,148, foreign-born, a decrease of 26,355 from 1920. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 124,522 or 30% were Norwegian, 87,072 or 21% Russian, 54,545 or 13.2% German. The rural population was 567,539 or 83.4% of the total, an increase of 8,906 or 1.6% from 1920; the urban population was 113,306 or 16.6% of the total, an increase of 25,067 or 28.4% since 1920. In 1930 the four largest cities were Fargo, 28,619; Grand Forks, 17,112; Minot, 16,099; Bismarck, 11,090.

**Occupations.** In 1930 240,303 persons, or 35.3% of the population, were gainful workers 10 years old or older; 84.9% of these were males and 15.1% were females; 75.4% were native white; 23.4% foreign-born white, and 1.1% other races. Among the chief occupations, with number of workers, were agriculture, 134,393; trade, 22,311; manufacturing, 21,995; professional service, 17,565; domestic and personal service, 17,497, and transportation and communication, 14,922.

### HISTORY

North Dakota, popularly called the "Sioux State" and more recently the "Flickertail State," once formed with its sister state to the south the Territory of Dakota, the Indian name meaning "allied." It was applied to the Indians of the region, and was another term for the Sioux confederacy. North Dakota was probably first seen by white men in 1738 when a French expedition led by the brothers VERENDRYE apparently penetrated the region. In the latter part of the 18th century fur traders from Canada pushed southward into the Dakota plains. In 1804 came the LEWIS AND CLARK expedition, which ascended the Missouri River, spent the winter in the Indian villages near Mindan and then went on westward. North Dakota was part of the territory acquired by the LOUISIANA PURCHASE, except for a small section north of the Pembina River, which had been purchased by Lord Selkirk from the HUDSON BAY COMPANY, and was afterward ceded to the United States.

Here he built a fort, and the first white settlement was made at Pembina about 1812 by French Canadians. Rivalry in the fur trade between British and American organizations ran high, and many forts and posts were established. The American Fur Company sent a steamer up the Missouri River in 1831. George Catlin visited the region in 1832, painting there some of his famous Indian portraits and making ethnological studies. Gen. Frémont's exploring expedition through the northwest in 1839 took him into the Dakota country. The northern part of the Louisiana Purchase was variously divided from time to time, and the Dakotas were successively a part of six large and almost unknown territories. In March, 1861, Dakota Territory was formed, including the present Dakotas, most of MONTANA and part of IDAHO and WYOMING. On Nov. 2, 1889, the territory was divided into North and South Dakota, their present boundaries were defined, and both were admitted into the Union. Bismarck was the capital of North Dakota, which had a population of 190,000. Constant hostility of Indians and lack of transportation had kept down immigration, but, with the settlement of Indian troubles and the coming of the railroads, the population increased rapidly, almost doubling in the decade after the date of admission. The agricultural depression has been heavily felt, depleting the values of farm lands and products, lessening incomes and greatly increasing farm mortgages. In 1912 was held in North Dakota the first state-wide preferential primary for President. In 1916 the state government passed into the control of the Non-Partisan League, a politico-economic organization of farmers under the leadership of A. C. Townley. Although Republican in national politics since 1920, in 1932 North Dakota's electoral votes went to Roosevelt. Senator Gerald P. Nye, Republican, was re-elected. H. C. DePuy, Democrat, was elected governor.

**BIBLIOGRAPHY.**—C. A. Lounsbury, *Early History of North Dakota* (1919); W. M. Wemett, *Story of the Flickertail State* (1923).

**NORTH DAKOTA, UNIVERSITY OF,** at Grand Forks, N.D., a coeducational state university, founded in 1883. It comprises colleges and schools of Law, Liberal Arts, Engineering, Commerce, Mines and Pharmacy and the Normal College. The productive funds in 1931 amounted to \$1,700,000. The library of 100,892 volumes contains the Hill Railroad Collections on North Dakota History and Politics, and Icelandic Collection. In 1931-32 there was a student enrollment of 1,621, with a faculty of 131 headed by Pres. Thomas F. Kane.

**NORTHERN IRELAND,** a division of the United Kingdom of Great Britain and Northern Ireland, comprising six parliamentary counties and two county boroughs of the province of Ulster. Area 5,263 sq. mi. The counties and county boroughs with their populations are as follows:

	Population 1926
Antrim .....	191,643
Armagh .....	110,070
Belfast, C. B. ....	415,151

	Population 1926
Down .....	209,228
Fermanagh .....	57,984
Londonderry Co. ....	94,534
Londonderry, C. B. ....	45,159
Tyrone .....	132,792
Total .....	1,256,561

The area consists of mountainous regions, between which are the broad valleys of the Foyle, Bann and Lagan. The country between the valleys of the Foyle and Bann is occupied by the Sperrin Mountains (Sawel, 2,240 ft.), which narrow down to the sea near Coleraine. To the east of the mouth of the Bann is the wonderful Giant's Causeway, a broad rock expanse of six-sided columns of basalt. The whole Antrim plateau is composed of sheets of this rock, which poured in a molten stream over this part of Ireland and northwards along the west coast of Scotland. The chalk and limestone which it covered to a great depth can be seen in the cliffs beneath the dark basalt. Beyond Belfast Lough are two conspicuous inlets, Strangford Lough, almost land-locked, and Carlingford Lough. Between them and adjoining the shore rise the granitic Mourne Mountains, whose conical peaks exceeding 2,000 ft. are landmarks for many miles to seaward. In the Bann valley lies Lough Neagh, 20 by 15 mi., a large shallow expanse of fresh water, and the largest lake in Britain and Ireland. At the extreme south of Northern Ireland lie two lakes: the upper and lower Lough Erne, connected by the river of that name. These lakes are studded with many beautiful islands and lie amid picturesque scenery.

On the Antrim coast a long gallery and chambers containing mining tools, baskets, and wheel-barrow made of basalt were discovered in 1770, conjecturally survivals of mining efforts by ancient man. The coal output of Northern Ireland is very small, but Antrim supplies annually about 12,000 tons of bruxite, a hydrous aluminum oxide from which aluminum is manufactured; this being the main source of supply of this mineral in the British Isles. Rock salt exists in thick beds near Carrickfergus in Antrim, and has been mined since 1850. Northern Ireland is rich in granite. About 2,600 persons are employed in the various mines and quarries. The output in 1929 was: igneous rocks, other than granite, 435,000 tons, sandstone 188,000 tons, chalk 254,000 tons, clay 189,000 tons and granite 94,000 tons.

The most fertile agricultural districts are in the valley of the Lagan including parts of Armagh, Down and Antrim, and the low-lying tracts beside the Bann. The principal crops are hay, oats, potatoes, turnips and flax. The livestock in 1929 was 699,986 cattle; 654,589 sheep; 192,058 pigs; 50,950 goats; and 92,130 horses.

The chief industries are the manufacture of linen, shipbuilding, rope-making and distilling. The manufacture of linen is now almost confined to Belfast and the vicinity. In this district it first received an important stimulus at the end of the 17th century

through the settlement of some Huguenot families. The linens include those of the finest quality, and one great advantage enjoyed by the district for the production of such goods is the excellence of the spring water used in bleaching, so that linens woven even in Central Europe, it may be from Belfast yarns, are sent to Northern Ireland to be bleached. For the finest linens flax is imported from Belgium and Russia, but in recent years Northern Ireland and Canada have been producing flax of as good a quality as the foreign growth.

The Belfast shipyards employ about 30,000 persons. The lack of important deposits of native coal and iron constitutes a serious handicap to any extensive industrialization. In Northern Ireland; however, Belfast and vicinity are close to British supplies of these materials which, with local cheap labor, support a considerable industry there. About Belfast the industry is parasitic, as the men work in the shipyards, and allied heavy trades, while the women and older children may supplement the family income by working in the linen factories. In a recent year the export of linen was valued at over \$50,000,000.

The religious professions as recorded at the census of 1926 were 781,652 Protestants and 420,428 Roman Catholics. The Queen's University of Belfast, founded in 1849, had 1,400 students in 1930. There are 2,000 national schools for elementary education, where attendance is compulsory. The secondary schools are of a high standard.

The constitution is federal in type, certain legislative and fiscal powers being reserved to the Parliament of the United Kingdom. The Parliament of Northern Ireland, consists of a House of Commons of 52 members elected by the people and a Senate of 26 Senators elected by the members of the House of Commons. The executive power is vested in a governor on behalf of the British sovereign. Northern Ireland is represented in the British Parliament by 13 members. *See also* IRELAND. H. A. A.

**NORTHERN LIGHTS**, or *AURORA BOREALIS*, strange, curtain-like formations of light appearing in the north, usually during the winter and spring.

**NORTHERN SECURITIES CASE**, a notable prosecution under the SHERMAN ANTI-TRUST LAW. The Northern Securities Company, an enterprise sponsored by J. P. Morgan and James J. Hill, was organized in 1901 with a capital of \$400,000,000, nearly all of which was issued to acquire the total stock of the Northern Pacific and Great Northern railroads, two parallel and competing lines. Federal Judge Amos M. Thayer in a Minnesota Circuit Court, Apr. 9, 1903, rendered a decision that the combination, in affecting the right of each railroad involved to fix its rates independently, was a direct restraint upon interstate commerce, and that the purpose of the corporation was in violation of the anti-trust laws. The Supreme Court upheld the decision in 1904, and ordered the dissolution of the corporation. The suit was instituted by Attorney General Knox at the request of President Roosevelt.

**NORTHFIELD**, a town of northwestern Massachusetts, in Franklin Co., situated about 40 mi. northeast of Springfield, on the Connecticut River. The Boston and Maine and Central Vermont railroads afford transportation. Northfield is a popular summer resort located in a rich agricultural region chiefly producing hay, potatoes and tobacco. Northfield Seminary for girls is located here, and the Mount Hermon School for boys is situated near by. Pop. 1920, 1,775; 1930, 1,888.

**NORTHFIELD**, a city in Rice Co., southeastern Minnesota, situated on the Cannon River, about 35 mi. south of St. Paul. Bus lines and four railroads serve the city. Holstein cattle are raised in this region; farming, horticulture, and dairying are also important interests. Northfield has foundries, machine shops, furnace factories, flour mills and a condensed milk plant. It is the seat of Carleton College and St. Olaf College. Goodsell Observatory of Carleton College serves the railroads of this region by broadcasting the time over the radio. Northfield was founded about 1851; chartered in 1875. Pop. 1920, 4,023; 1930, 4,153.

**NORTHFIELD**, a town of Central Vermont, in Washington Co., on the Dog River, 10 mi. southwest of Montpelier. The Central Vermont railroad affords transportation. Black slate quarries are in the vicinity, and Northfield manufactures hosiery and woolen goods, and has lumber mills and granite-cutting plants. Norwich University is located here. Pop. 1920, 1,916; 1930, 2,075.

**NORTH GERMAN CONFEDERATION**, the name of the union of 22 of the German states north of the River Main (all except Limburg and Luxemburg) which was established in 1867 as a result of the defeat of Austria by Prussia in the Seven Weeks' War. It lasted until 1871, being replaced by the German Empire after the Franco-Prussian War. The constitution for this confederation was largely composed by the Prussian Minister-President Bismarck, and it was he who invented the name *Bundesrat* to designate an upper house wherein the princes would be represented, while the *Reichstag* represented the people. The document was first endorsed by the princes, then ratified by a constitutional convention elected on a basis of universal manhood suffrage, and finally ratified by each of the 22 states individually. The first Confederation parliament met in the fall of 1867.

The executive power of the federation was placed in the hands of the king of Prussia, who became hereditary president of the union. The federal chancellor was to be appointed by, and responsible to, the president, who also was entrusted with the responsibility for the conduct of foreign relations, was placed in command of the army and was given the power to declare a defensive war. Every one of the member states had to institute a system of compulsory military service fashioned after that of Prussia. The princes were permitted to appoint the delegates to the upper house, but there was universal male suffrage insofar as the lower house was concerned. The various princes were still permitted to exercise

fairly wide sovereign powers, including the rights to call local parliaments and to levy taxes.

The four German states south of the Main—Bavaria, Baden, Württemberg and Hesse-Darmstadt—were bound to the Confederation by a series of military treaties and by customs agreements. When the German Empire was organized after the defeat of France by the combination of Prussia and all the other German lands, the constitution of the Confederation, with a few slight alterations, became the instrument of government of the new state. The four southern states, however, insisted upon retaining certain special rights, known as *Sonderrechte*. W. C. L.

**NORTH HOLLYWOOD**, a city in Los Angeles Co., southern California, situated 5 mi. north of Hollywood and served by the Southern Pacific Railroad, the Pacific Electric Railway, and by bus lines. The town is a center for the moving picture industry and airplane manufacture. The community is largely residential, and growing rapidly on account of the overflow population from Los Angeles and Hollywood. North Hollywood was founded about 1895. Pop. 1920, 2,372; 1930, 18,500.

**NORTH LITTLE ROCK**, a city in Pulaski Co. in central Arkansas, situated on the Arkansas River opposite Little Rock. The chief manufactures are railroad shop and hardwood lumber products. In 1929 the factory output reached an approximate total of \$11,000,000; the retail trade amounted to \$6,809,476. Pop. 1920, 14,048; 1930, 19,418.

**NORTH MANCHESTER**, a town in Wabash Co., northeastern Indiana. It is situated on the Eel River, 37 mi. northeast of Logansport and is served by bus lines and two railroads. Grain and livestock-raising are the leading interests of the region. Furniture is the chief local manufacture. North Manchester is the birthplace of former Vice President Thomas R. Marshall and the seat of Manchester College, co-educational. The town was founded in 1835 and incorporated in 1874. Pop. 1920, 2,711; 1930, 2,765.

**NORTHMEN**, the Scandinavian sea-rovers who in the Middle Ages carried invasion and settlement into much of the known world. The Danes and Norwegians made conquests in northwestern Germany and France, including Normandy, in Aquitania and Spain, Galicia, Italy and Greece, and along the African coast. From Iceland they colonized Greenland in 983, subsequently reaching the New World. The British Islands were continually harried, England being first invaded about 787. In 1013 the British king submitted to the overlordship of SWEYN, the Dane. Swedish Northmen established kingdoms at Novgorod and Kiev in Russia, and the Varangian bodyguard of the Byzantine emperors was largely composed of Scandinavians.

**NORTH PACIFIC FISHERIES TREATY**, an agreement, signed Mar. 2, 1923, to preserve the fisheries of the northern Pacific Ocean. It was negotiated by Secretary of State Charles Evans Hughes for the United States and Ernest Lapointe, Minister of Marine and Fisheries of Canada, for Great Britain.



By this treaty citizens of the United States and of Canada were prohibited from fishing for halibut in the high seas and the territorial waters of the western coast, including the Bering Sea, from Nov. 15 to Feb. 15 annually. An international commission of four members, two from each country participating, was provided for, to investigate the life history of the Pacific halibut and make recommendations for its preservation.

**NORTH PLAINFIELD**, a borough of Somerset Co., N.J. North Plainfield and the city of PLAINFIELD, while in separate counties, are geographically one, and North Plainfield is primarily a residential district. Pop. 1920, 6,916; 1930, 9,760.

**NORTH PLATTE**, a city in southwestern Nebraska, the county seat of Lincoln Co., situated between the North and South Platte rivers, 300 mi. west of Omaha. Buses and the Union Pacific Railroad afford transportation. There is an airport. Grain and live stock are raised in the vicinity. The city has large icing plants. In 1929 the total manufactures was approximately \$1,700,000; the retail trade amounted to \$9,138,443. Located here are two government weather bureaus, the University of Nebraska Experimental Sub-station and the Great Plains Broadcasting Station. Scouts Rest, a ranch once owned by Buffalo Bill, is three mi. from the city. North Platte was founded in 1867; incorporated in 1871. Pop. 1920, 10,466; 1930, 12,061.

**NORTH PROVIDENCE**, a town in eastern Rhode Island, a suburb of Providence in Providence Co. It is served by the New York, New Haven & Hartford Railroad, and is an industrial community, chiefly making woolen goods. In 1929 the retail trade amounted to \$1,453,635. Pop. 1920, 7,697; 1930, 11,104.

**NORTH RIVER**, the name given to the course of the Hudson River from the northern city line of the Bronx, New York City, to its mouth in the Upper Bay. The name dates from the colonial era when the stream was called the North River to differentiate it from the South (or Delaware) River. It has an average width of 1 mi. and a channel depth at low water of 40 ft.

**NORTHROP, CYRUS** (1834-1922), American educator, was born in Ridgefield, Conn., Sept. 30, 1834. He graduated in 1859 at Yale and in 1860 was admitted to the bar. For two years he acted as clerk of the Connecticut House of Representatives and Senate, and in 1863 returned to Yale as professor of English literature, a post he held for 21 years. In 1884 he was elected president of the University of Minnesota, then a small institution of three colleges and about 300 students, and by his direction made it one of the leading state universities. Northrop became president emeritus in 1911. He died in Minneapolis, Apr. 3, 1922.

**NORTH SEA**, a large branch of the Atlantic Ocean, or a southern extension of the Arctic Ocean, lying between Great Britain and Europe, with the British Isles and the Orkney and Shetland islands on

the west; Denmark and part of Norway on the east; Strait of Dover, part of France, Belgium, Holland and Germany on the south; and the Arctic Ocean on the north. The Atlantic enters by the passage between the Orkney and Shetland islands and through the Strait of Dover. The extreme length is over 600 mi. and the maximum width about 400 mi. In 1921 Kossinna estimated the area as 575,000 sq. km. or 222,000 sq. mi. The North Sea is deepest on the Norwegian side, where the soundings exceed 2,000 fathoms; but its mean depth is not more than 31 fathoms. The bed of the sea is traversed by enormous banks or elevations, of which the greatest is the Dogger Bank. The shores are for the most part low, except in Scotland and Norway. They present numerous inlets which are studded with many important towns, the sea being the highway for an immense maritime traffic. The fisheries, especially herring, cod, haddock and flatfish, are very valuable. The sand banks, winds and fogs make navigation difficult and often dangerous.

**NORTH SYDNEY**, a town of Cape Breton Co., Nova Scotia, Canada, situated 5 mi. northwest of Sydney across Sydney Harbor, and about 200 mi. northeast of Halifax. Iron, copper, silver and some gold are mined in the region, and there is important coal production for which North Sydney is a shipping port. As at Sydney, there are furnaces of the Dominion Iron and Steel Co., and also cod-liver oil reduction plants and commercial fisheries. Pop. 1921, 6,585; 1931, 6,139.

**NORTH TARRYTOWN**, a residential suburb of New York City and an independent branch of the Tarrytown post-office, situated in Westchester Co., on the Hudson River. It is served by the New York Central Railroad and by river craft. Automobile motors are manufactured here. The vicinity has many landmarks of the American Revolution. Pop. 1920, 5,927; 1930, 7,417.

**NORTH TEXAS STATE TEACHERS COLLEGE**, a coeducational institution at Denton, Tex. It was founded in 1901 by the state legislature, and was reorganized as a teachers' college in 1919. The productive funds in 1931 were \$463,300. The library contained 41,252 volumes. In 1931-32, there were 1,470 students enrolled in the regular session, with a faculty of 106, headed by R. L. Marquis.

**NORTH TONAWANDA**, a river port city in Niagara Co., western New York, situated on the Niagara River at the western terminus of the State Barge canal, 11 mi. north of Buffalo. It has a fine harbor and is served by lake, canal and river craft, bus lines and three railroads. North Tonawanda and the neighboring city of Tonawanda form one industrial community, and are an important shipping center and market, especially for white pine lumber. Hydro-electric power is supplied by Niagara Falls. The principal manufactures include bolts and nuts, musical instruments, chairs, office equipment, equipment for steam heating plants, paper, rayon underwear, fiber and lumber products. In 1929 the manu-

factures of North Tonawanda itself were valued approximately at \$33,600,000; the retail trade was worth about \$7,040,000. North Tonawanda was founded in 1836 and granted a city charter in 1897. Pop. 1920, 15,482; 1930, 19,019.

**NORTHUMBRIA**, a powerful Anglo-Saxon kingdom between the Humber and the Forth rivers. Northumbria was formed by the union in 617 of the independent kingdoms of Bernicia and Deira, and immediately became the dominant state in England under its king, Edwin, 617-33. The Northumbrian kings that succeeded him defeated the Picts, the Welsh and the Scots. They succeeded in encroaching on the lands to the south, and even extended their domain over the Lowlands of Scotland. The power of the Northumbrian kings declined towards the end of the seventh century, and first **MERCIA** and then **WESSEX** assumed the hegemony over the Anglo-Saxon kingdoms. However, before Northumbria lost its ascendancy, it had become a great ecclesiastical center with an archiepiscopal see at York and had made significant strides in the cultivation of literature, especially in the monastery at Yarrow.

**NORTH VANCOUVER**, a city of British Columbia, Canada, situated on the north shore of the Burrard Inlet across from Vancouver. Connected by bridge and rail with the larger city, it shares its industrial activities, having lumber and shipbuilding yards, oil-refining works and sawmills. Attractive features of the city are the wide thoroughfare, Grand Boulevard, and the beautiful environs. North Vancouver was incorporated May 1, 1907. Pop. 1921, 7,652; 1931, 8,510.

**NORTHWESTERN UNIVERSITY**, a coeducational institution situated at Chicago and Evanston, Ill., was founded in 1851. It is privately controlled, non-sectarian, and affiliated with the Methodist Church. The greater part of the university is located in Evanston. Schools of Medicine, Law and Dentistry, and departments of the schools of Commerce and Journalism are located on Alexander McKinloch Memorial Campus, Chicago. The university had endowment funds in 1931 totaling \$25,423,108. The Orrington Lunt Library of 355,571 volumes contains the Greenleaf Collection of classics and the Elbert H. Gary Library of Law. In 1931-32 there were 6,862 full time students and a faculty of 562, headed by Pres. **WALTER DILL SCOTT**.

**NORTHWEST FUR COMPANY**, a Canadian corporation organized at Montreal in 1783-84, representing a combination of Montreal merchants of Scotch descent whose previous experience as individuals in the fur trade of the Great Lakes region and farther west had persuaded them to amalgamate to meet the competition of the **HUDSON'S BAY COMPANY**. The Grand Portage, on the northern shore of Lake Superior, became the field headquarters of the company. In 1787 a rival association, Pond, Pangman, and Co., which included **ALEXANDER MACKENZIE** (1755-1820), merged with it, and thereafter the Northwest Company followed a policy of expansion. Mac-

kenzie's explorations extended to the Pacific; David Thompson, astronomer and surveyor for the company, reached the Columbia. After eight years of progress a seceding group, headed by Mackenzie, formed the New Northwest Co., popularly called the X Y Co., and vigorous rivalry began between these groups. But on the death of Simon McTavish, leader of the older company, in 1804 the companies merged. Surveys revealed the Grand Portage to be in United States territory and headquarters were shifted north to Ft. William (named after William McGillivray, chief agent of the company in Montreal). Following the **BATTLE OF SEVEN OAKS** and the subsequent litigation, in 1821 the Northwest Company was absorbed by its greater rival, the Hudson's Bay Co.

**NORTHWEST ORDINANCE.** See **ORDINANCE OF 1787**.

**NORTHWEST REBELLION**, 1885, in Canadian history, the insurrection of the half-breed population of the Saskatchewan valley in protest against the land policy of the Dominion Government. The Métis were centered about the junction of the North and South Saskatchewan rivers; most had moved into the region from the Red River Settlement. The half-breeds within the province of Manitoba had received land grants from the Government; but no provision was made for the half-breeds in territories as yet unorganized. In 1882 a land boom in the West began, and the Métis feared the loss of their holdings. In 1884 they invited Louis Riel, leader of the **RED RIVER REBELLION**, into their settlement. At a meeting at St. Laurent, Sept. 1884, a bill of rights was formulated, demanding a subdivision into provinces of the Northwest Territory; land-grants of 240 acres to the individual, as in Manitoba; the sale of a half-million acres of public land for establishment of hospitals and schools and for relief of the poor; grants of at least \$1,000 for the support of a nunnery in each settlement; and better provision for the support of the Indians, whose chief subsistence, the buffalo herds, was being rapidly depleted. Early in Mar. 1885, the Mounted Police gave warning of the imminence of rebellion; but the Government remained inactive. On the 17th the Métis met at St. Laurent and formed a provisional government with Riel as president and Gabriel Dumont adjutant-general. The Indians joined the rebellion. Stores were seized, and telegraph wires cut. On Mar. 25 the insurgents captured the Duck Lake post and confiscated Indian and Government stores there. A force of Mounted Police and volunteers attempting to recover the post was defeated. The Government was moved to action. Within a month 3,000 troops were transported from eastern Canada, and about 1,500 from Manitoba and the northwest. These, with the Mounted Police, were under the general command of Gen. Middleton. Meanwhile the insurgents had attacked the fort at Battleford and plundered the stores, and several men had been murdered by Indians. Middleton's force used the Canadian Pacific Railway as

a base of operations. The troops advanced in three divisions, to Batouche, Riel's headquarters; Battleford; and Edmonton. The force advancing to Battleford was repulsed by the Indians under Chief Poundmaker. Middleton, marching against Batouche, was temporarily checked by Dumont; but his victory at Batouche caused the disintegration of the rebellion. On May 15 Riel, a fugitive, was captured. When he was tried at Regina, his counsel pleaded insanity. The jury found him guilty, but recommended mercy. The recommendation, however, was overridden, and Riel and eight Indians were hanged, Nov. 16. The French-Canadians of Quebec, Laurier and many other leaders, protested the sentence. About 200 lives were lost in the course of the rebellion.

**NORTHWEST TERRITORIES**, a name formerly given to all British North America lying northwest of the St. Lawrence Basin, but since 1920 the name given to the Canadian mainland east of the Rockies, west of Hudson Bay and north of latitude 60° N., together with all the northern archipelago. This area is subdivided into three provisional districts known as Mackenzie, Keewatin and Franklin. The territories have an estimated area of 1,309,682 sq. mi., of which the greater part has never been thoroughly explored.

The Northwest Territories consist of the territories formerly known as Rupert's Land and the North West Territory, except such portions as form the provinces of Manitoba, Saskatchewan and Alberta and the Yukon Territory, together with all the British territories and islands not included within any province, except the colony of Newfoundland and its dependencies. The territories are administered by the Canadian Department of the Interior.

The southern part of the region bears a comparatively light forest growth, but the northern portion is treeless. The agricultural possibilities are limited to the alluvial plains of the Mackenzie Basin which possess a rich soil. In favorable years cereals and vegetables have been successfully grown at Fort Simpson and Norman. Grazing lands for reindeer and musk-ox occur to the south of Great Slave Lake and along Slave River. The northern portion of the region is very cold in winter; in the south the winters are long, dry and cold, and the summers pleasantly hot and short, when the profusion of wild flowers and grasses make the term "barren lands" inaccurate.

Fur is an important product, the varieties of furbearing wild animals ranging from rabbit to white fox, bears and reindeer; for the season 1927-28 the pelts purchased by traders were valued at nearly \$3,000,000. The inhabitants are Indians, Eskimos, trappers, Hudson's Bay Company employees, Royal Canadian Mounted Police and a few missionaries. Pop. 1921, 7,988; 1931, 7,133.

**NORTHWEST TERRITORIES PURCHASE**, 1869, the acquisition by the Dominion of Canada of the Hudson's Bay Company's domain in British North America. By virtue of its charter of 1670, the fur company exercised governmental and property rights

over the area between Ontario and the Rocky Mountains. Extinction of this title was the first step in the Dominion's program of westward expansion. William McDougall and Sir George Cartier in 1868 were sent to England for the purpose; McDougall had promoted the movement for acquisition since 1856. The Hudson's Bay Co., unwilling to accept moderate compensations, seems to have been prevailed upon by WILLIAM GLADSTONE, and a tripartite arrangement, including the Imperial Government, was effected whereby the Dominion paid the company £300,000 for the transfer of the country and extinction of the company's various monopolies. The company retained land adjacent to the trading posts, and two sections in each township, about one-twentieth of the aggregate of 2,500,000 square miles. The error of the negotiating parties in failing to consult representatives of the 175,000 inhabitants of the transferred domain led to the RED RIVER REBELLION.

**NORTHWICH**, a market town of Cheshire, England, about 171 mi. northwest of London and 16 mi. northeast of Chester, on the Weaver River. Large amounts of salt are taken from salt mines and brine springs located here. As a result of the mining operations, many of the houses have tilted over on an angle with the sinking of the soil. Pop. (of town and district) 1921, 18,381; 1931, 18,728.

**NORTON, CHARLES ELIOT** (1827-1908), American writer and scholar, was born at Cambridge, Mass., Nov. 16, 1827, and was educated at Harvard. With JAMES RUSSELL LOWELL he edited *The North American Review* from 1864-68, and was Professor of the History of Art at Harvard for 24 years. His prose translation of Dante's *DIVINE COMEDY* is perhaps his chief literary production. Among other works are several memoirs of friends, including Lowell, Curtis and Longfellow. He published the correspondence of Carlyle and Emerson and Ruskin's *Letters to Charles Eliot Norton*. By his writings, lectures and the example of his personal life Norton did much to create a finer harmony between the culture of Europe and that of America. He died in Cambridge, Mass., Oct. 21, 1908.

**NORTON, THOMAS** (1532-84), English poet, dramatist and lawyer, was born in London in 1532. He was educated at Cambridge, and later was secretary to the Protector Somerset. After entering Inner Temple in 1555, he became counsel to several civic bodies, and entered Parliament in 1558. He is chiefly remembered for his share with THOMAS SACKVILLE in the tragedy, *Gorboduc*, played before Queen Elizabeth Jan. 18, 1561, and for the severity in his punishment of Catholics, which earned him the nickname of Rackmaster General. At the last he was charged with treason and imprisoned in the Tower, but was freed by Walsingham. He died soon afterwards on Mar. 19, 1584. The chief importance of *Gorboduc* lies in its being the first English tragedy and in its having introduced blank verse to the English stage.

**NORWALK**, a manufacturing city in Fairfield Co., southwestern Connecticut, situated on Long Island

Sound, 40 mi. northeast of New York. It is served by the New Haven Railroad. The chief local manufactures are hats, shoes, shirts, underwear and other clothing, paper, rubber products and hardware. The total value of manufactures, 1929, was \$17,558,073. In 1929 the retail business amounted to \$22,090,364. The city has also considerable coastwise trade, with regular steamship service to New York, and important fisheries, the Norwalk oyster being particularly famous. Norwalk was settled in 1649 and chartered in 1651; in 1913 seven adjacent towns were consolidated with the city, which now has an area of 25 sq. mi. During the Revolution, in 1779, Norwalk was burned by British and Hessian troops. Pop. 1920, 27,743; 1930, 36,019.

**NORWALK**, a city in northern Ohio, the county seat of Huron Co., situated 12 mi. southeast of Sandusky. It is served by two railroads. The surrounding region has truck and fruit farms and dairies. In the city are a piano factory, canneries, an automobile accessory plant and other industrial concerns. Norwalk was settled in 1817 by colonists from Connecticut who had suffered loss of property during the War of 1812. It was chartered as a city in 1881. The birthplace of Thomas Edison is near by. Pop. 1920, 7,379; 1930, 7,776.

**NORWAY**, the northernmost country and kingdom forming the northwestern part of the Scandinavian peninsula of northern Europe, bounded on the east by Sweden, northeast by Finland, south and southeast by the Skagerrak, north by the Arctic Ocean, west by the North Sea and northwest by the north Atlantic Ocean. The length of Norway is about 1,100 mi., the greatest breadth 250 mi., the average breadth about 60 mi. The length of the entire shoreline, including the fjords and the larger islands, has been estimated at 12,000 mi. The total area has been estimated at 125,086 sq. mi.

**Surface Features.** The principal mountainous region of Scandinavia, the Kjølen, separates Norway from Sweden and gives to Norway in the northern part a very narrow fringe of rugged land. The rest of the surface is mountainous and for the most part barren. The mountain masses mostly assume the form of plateaus or tablelands. The highest summits belong to the Sogne Fjeld, a congeries of elevated masses, glaciers and snowfields in the center of the southern division of the kingdom, where rises Galdhøpiggen, 8,097 ft.\* high, the highest mountain in Norway.

**Fjords.** The fjorded coast of Norway owes its form to the action of several agents. Originally the steep west-facing slope of the highland was dissected by rivers which carved deep valleys. During the great Ice Age glaciers moving seaward through these valleys greatly deepened them, and also changed their cross section from a V to a U shape. With the melting of the ice, and probably also a sinking of the coast, the ocean waters penetrated the seaward openings of the valleys, forming fjords. Their walls are often perpendicular or nearly so, and may extend for

a half mile or even a mile above sea level. The water is very deep, occasionally reaching 2,000 ft. though a sill at the ocean entrance marking the former limit of the ice tongue makes the water somewhat shallower there. Frequently the heads of neighboring fjords meet, forming islands, of which it is estimated there are some 150,000 off Norway, forming an almost continuous chain or skerry guard. Thus close to the mainland is the quiet protected water of so much importance to fishermen and sailors. Some of the more notable of the fjords are Sogne, 136 mi. long with a maximum depth of over 4,000 ft., and Hardanger, 119 mi. long and over 2,100 ft. in depth, while Stavanger, Nord and Vest fjords are almost half a mile deep.

**Climate.** In spite of its northerly location in the latitude of Greenland and Labrador, Norway is a most progressive nation. The explanation of the contrast in these two regions on either side of the North Atlantic lies in their position relative to the ocean. The climate of Scandinavia on the leeward side of the waters warmed by the North Atlantic Drift is greatly modified, especially on the western slopes. As a consequence of this oceanic influence the coast even at the far north is ice-free throughout the year and has the same January temperature average as central Bulgaria, 2,000 mi. to the south. The winter temperature in the vicinity of the Lofoten Islands is more than 40° F. higher than the average for that latitude, and represents the maximum divergence from the normal of any place on earth. Within Norway the distribution of temperature depends more upon elevation and distance from the sea than upon latitude. Upon the high plateau the winters are very severe and even in summer the nights are cool. There is no part of Norway rendered unsuitable for agriculture on account of scanty rainfall. On some parts of the plateau it has been estimated that over 200 in. fall annually. The high latitude carries with it a commensurate variation in the length of day and night. This increases northward until at North Cape there is a continuous night of 2½ months in midwinter and a correspondingly long day in midsummer.

**Population.** The census of 1920 gave the population as 2,649,775; in 1930, it was 2,809,564. The density is only 22.5 per sq. mi. The population is singularly homogeneous. There are about 20,000 Lapps in Norway. Many Norwegians have emigrated to the United States. Oslo, the capital, had a population in 1930 of 249,688; BERGEN, 98,546; and Trondheim, 54,135.

**Religion and Education.** The State religion is Evangelical Lutheran, and the king must be a member of that church. All religions are tolerated. Education receives particular attention from the State and local authorities, and is compulsory. The elementary and higher schools are well-equipped. The University of Oslo is subsidized by the State.

**Agriculture.** With about three-fourths of her land unproductive, Norway has the smallest culti-

vated area of all the countries in Europe, lower even than Switzerland. While it is estimated that Norway may slightly increase the tilled acreage, it can be done only with government aid. The cost of clearing, removing boulders and draining runs from \$140 to \$1,000 per acre. The soils in general are hard to work, often glacial or avalanche deposits so full of stones or so steep as to make cultivation extremely difficult. Some farms can be reached only by the aid of ladders laid up the mountains. There are large farm lands behind TRONDHEIM and around Oslo, where 15% of the total area is in crops; the acreage under wheat is increasing and that under rye decreasing. Most of the tilled land is in the hands of the peasant proprietors who grow barley, oats and potatoes, with such grasses as timothy and clover wherever the climate is cool and moist. In Norway, in localities of high latitude or high altitude up to 2,500 ft., barley is the only cereal of importance, and it is more valuable for pigs and other stock than for human food. The result is that animals are now more important than crops. In some places there are two or three months of summer pasture, which is invaluable; but the long winters make the provision of winter cattle-fodder exceedingly important. This accounts for the spread of root crops and for the scientific treatment of hay, including the constant mowing which greatly improves the quality of the grass; cutting increases the percentage of protein so much that pulped grass from lawn cuttings is almost as good as meal for pigs. And the cattle, like their owners, eat quantities of fish in winter.

**Forests.** Of the total woodland surface of the country, about one-half of the merchantable stand is on the southeastern slope draining to the Skagerak. On account of little restriction upon cutting, the forested areas, mainly of pine and fir, have been reduced by about one-third and now cover only 21% of the total surface. The ready accessibility of the original forests to the deep, well-protected fjords open all the year, and the presence of many streams for floating and for power for the mills together with the attractive English market near by, have led to a serious depletion of timber. The forests now have an estimated value of \$250,000,000. In recent years the government has planted between 10 and 15 million trees annually. Forestry inspection is now very strict, no cutting being allowed without equalizing re-planting.

**Water Power.** Norway probably has the most favorable combination of natural conditions for the development of water power to be found anywhere in the world. The chief handicap is the comparative scarcity of local markets and raw materials, wood being about the only raw material available. As a result of the naturally favorable factors, water power has been developed in large quantities at little expense. Cities on the west coast in places may purchase it at the extremely low rate of \$4.80 to \$7.60 per horsepower year. Of great significance is

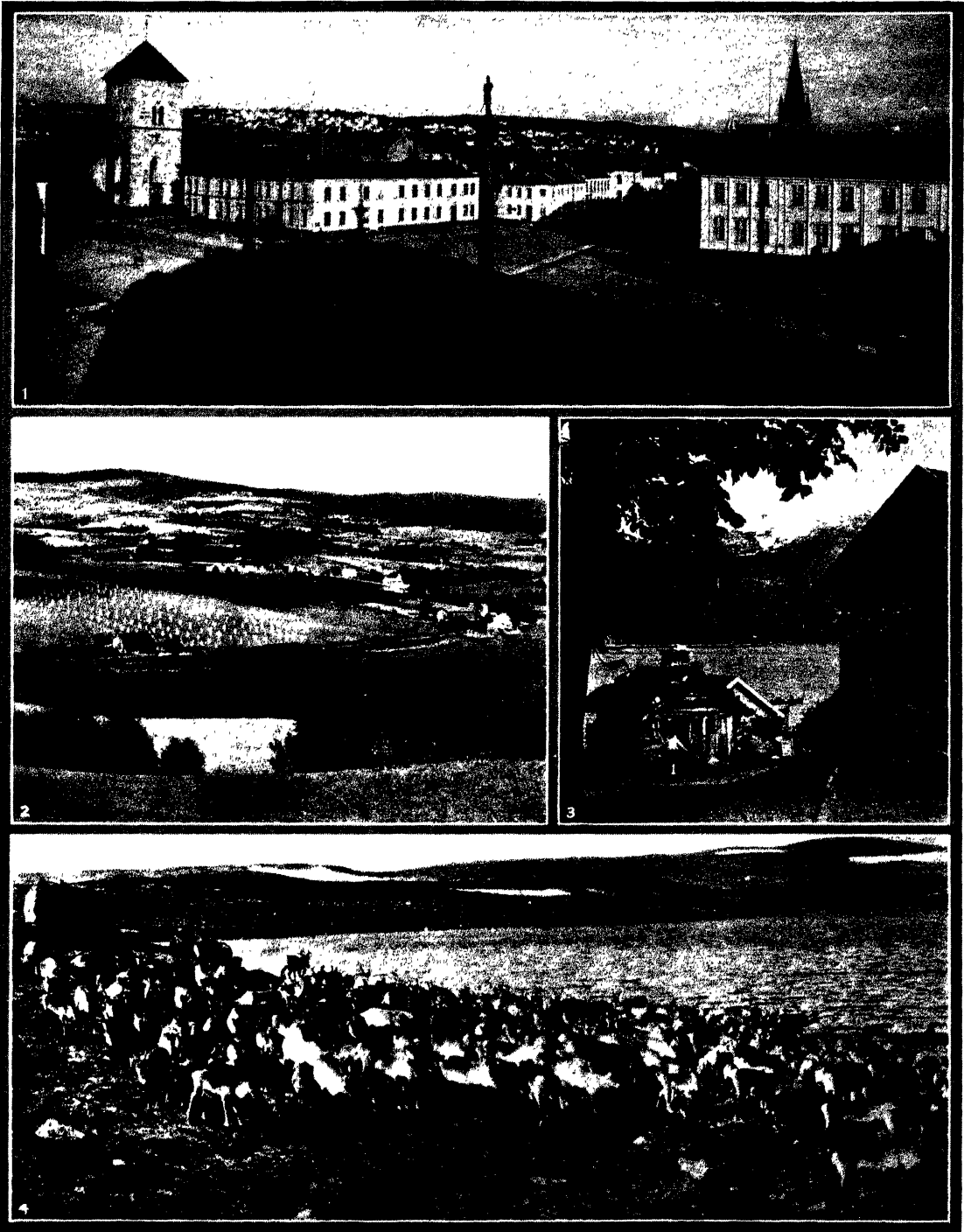
the availability of electric power and current to the rural population and in the fishing ports for lighting and heating. In view of the scarcity of minerals (the value of the mineral output, pyrites and iron ore is about \$5,000,000 per year), the enormous hydroelectric energy available is of fundamental importance in shaping the economic development of the country. Any considerable growth of the population must depend upon industrial development which in turn hinges upon water-power exploitation.

**Fisheries.** Big Norwegian catches depend on abundance of fish food, and this is seasonal. Any great increase in the supply is associated with the thaw flood of spring and the rain flood of autumn. The fish follow the flood and the fishermen, some 30,000 to 40,000 with 7,000 to 8,000 boats, follow the fish. Great quantities of cod and herring are caught and dried, salted or cured. Norwegian ships go whaling off equatorial Africa and in the Antarctic, and sealing off Iceland and Spitzbergen. Modern whaling operations are carried on by huge floating factory ships each attended by three or more chasers (*see WHALING*). The latter capture the animals and turn them over to the large factory vessel which extracts and refines the oil. A single vessel may carry 40,000 bbls. of oil. The value of whaling now equals that of all the other fisheries of the country. Norwegian whalers produce about two-thirds of the world's whale oil production.

**Transportation and Trade.** The protected, ice-free coastal waters, the abundant food supplies furnished by the sea, with the meagerness of agricultural resources have made the Norwegians a nation of sailors. Shipping there gives employment to one-fifth of the adult male population, and the country has long held first rank in per capita tonnage of merchant marine. Although the Germans sank about 1,000,000 tons of her shipping during the war, Norway's mercantile marine ranks third in Europe and fourth in the world, 10% being still under sail. The earnings of the merchant marine with that of the whale fisheries and tourist traffic are important factors in correcting the unfavorable trade balance of \$75,000,000 to \$80,000,000. The chief exports are fish and forest products, and imports are grain, textiles, sugar, coffee, tobacco and petroleum. Pulp and paper figure largely in export tonnage.

**Industries.** The industrial use of water power in Norway began in 1845 with the manufacture of textiles. Within the next 30 years it had become the sole source of power for making pulp. Those establishments using water power rank next to agriculture and forestry in the number of people employed. Local conditions have favored the development of manufactures demanding raw materials of small bulk but requiring much power for their fabrication. Norway was the first nation to produce nitrogen compounds on a commercial scale, admirably supplemented by the rapid growth in the manufacture of calcium nitrate, cyanamide, aluminum, ce-

# NORWAY



COURTESY OF THE NORWEGIAN CONSULATE GENERAL; 2, 3, 4, THE NORWEGIAN GOVERNMENT RAILWAY

## URBAN AND RURAL SCENES IN NORWAY

1. A section of Trondheim, on the western coast. 2. A prosperous farming district in the eastern part of Norway.
3. Farm buildings in the Sogne fjord district near Balestrand. 4. Reindeer at a lake shore in the highlands.

# NORWAY

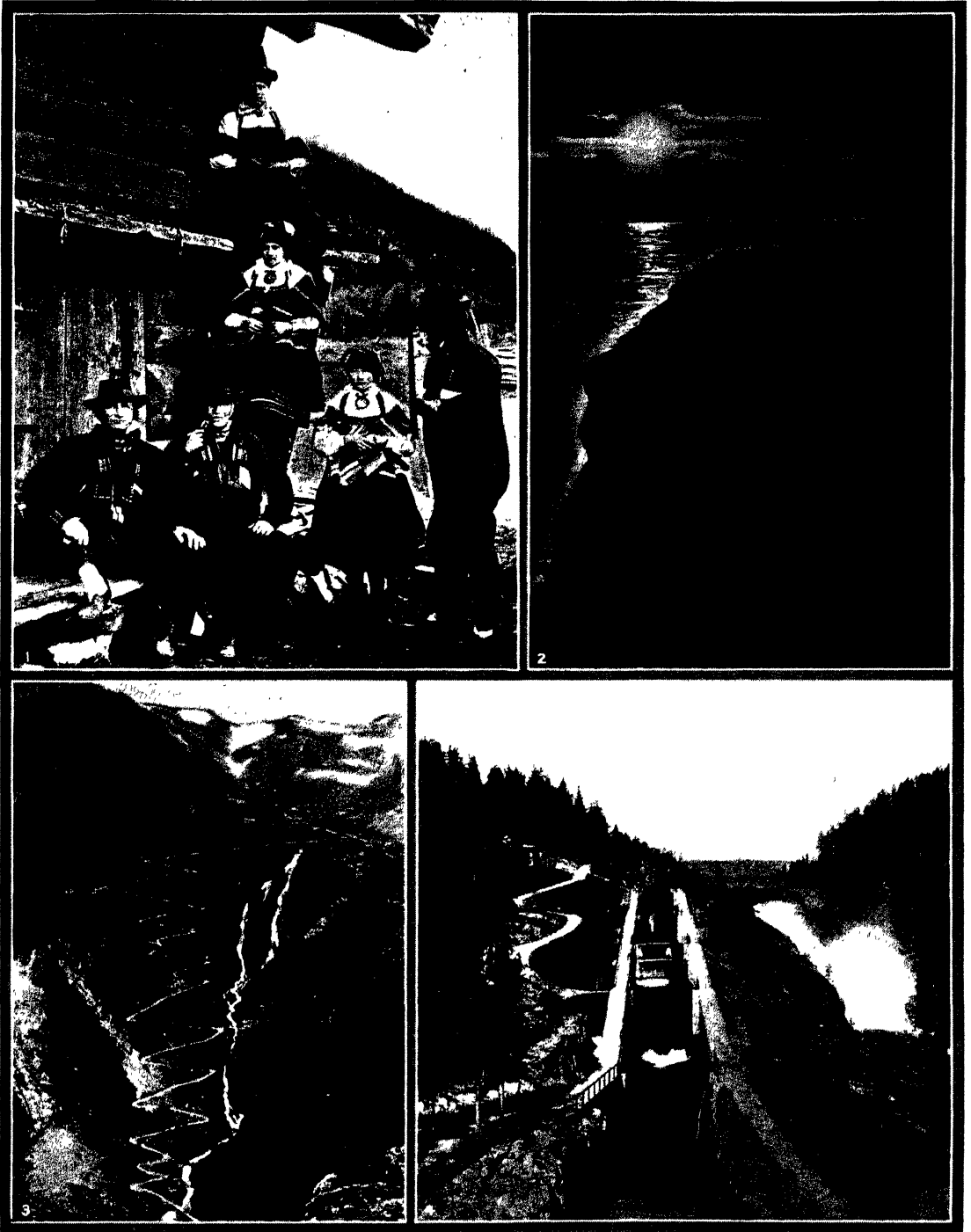


1, 2, 3, COURTESY OF THE NORWEGIAN GOVERNMENT RAILWAYS; 1, PHOTO FROM DEN BLESSUM; 4, PHOTO FROM NORWEGIAN CONSULATE GENERAL

## ASPECTS OF NORWEGIAN LIFE

1. Timber Church, 800 years old, in the Open Air Museum at Oslo. 2. Costumes worn by the natives in Setesdal Valley.
3. The Seven Sisters Waterfall at Geiranger. 4. View from Turnabout Tunnel on the Romsdal Railway.

## NORWAY



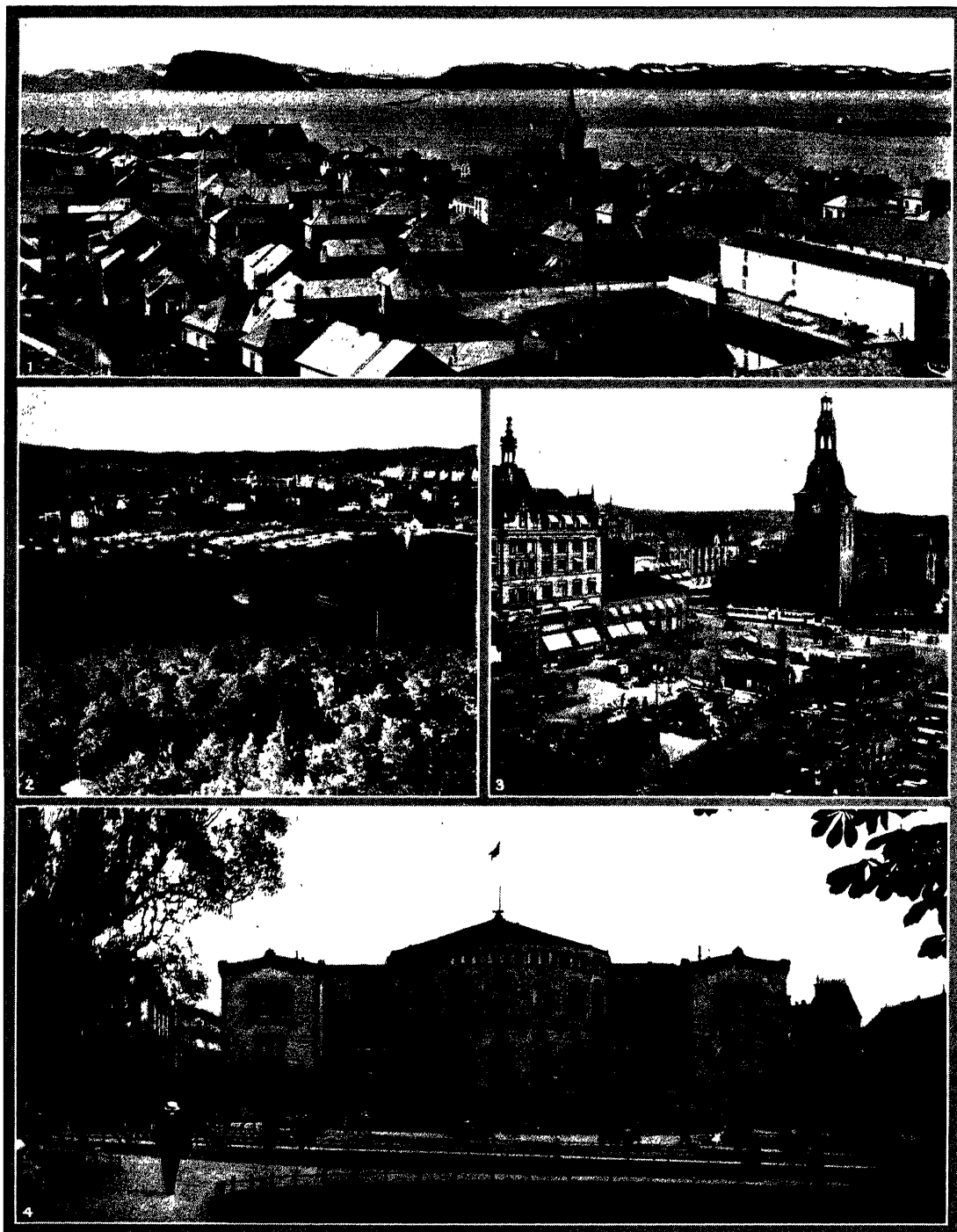
COURTESY OF THE NORWEGIAN GOVERNMENT RAILWAYS

### NORWEGIAN COUNTRY AND MOUNTAIN SCENES

1. Peasants of southern Norway in their native dress. 2. View of the midnight sun at North Cape. 3. Flaamsdal Canyon, showing the road winding up the gorge. 4. Locks in the Bandak Canal, which connects Skien and Dalen.



# NORWAY



COURTESY NORWEGIAN GOVERNMENT RAILWAYS

## VIEWS OF NORWAY'S CAPITAL AND THE CITY FARTEST NORTH

1. Hammerfest, Norway, the most northern city in the world. 2. Oslo, the Norwegian capital, seen from Bygdøy.

3. The busy market place and the church of Our Savior, Oslo. 4. The Storting Parliament Building, Oslo.



## NORWAY

Area 124,984 sq. m.  
Pop. .... 2,809,564

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

18 Aalesund... J 5

10 Arendal... N 6

99 Bergen... L 3

Christiana, see Oslo.

19 Christiansand... N 5

15 Christiansund... 6

25 Drammen... B 2, Ms

10 Eidsvold... L 10

11 Elverum... L 10

Frederikstad, see Halden.

14 Fredrikstad... F 7, M 9

10 Halden... N 9

17 Haugesund... 3

11 Horten... D 4, M 8

8 Kongsberg... M 8

10 Larvik... G 1, N 8

8 Moss... D 5, M 6

10 Narvik... D 16

250 Oslo... A 6, M 9

9 Porsgrund... N 7

12 Ringsaker... L 9

12 Sarpsborg... M 9

16 Skien... M 8

46 Stavanger... M 8

12 Tønsberg... E 3, M 8

10 Tromsø... B 16

54 Trondheim (Nidaros)... I 9

8 Voss... L 6

## SWEDEN

Area 173,105 sq. m.  
Pop. .... 6,141,171

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

9 Allingsås... O 10

7 Amal... N 11

8 Arvika... M 11

7 Boden... P 10

38 Borås... O 11

8 Byske... G 19

7 Eksjö... O 13

33 Eskilstuna... M 15

7 Falköping... O 12

13 Falun... L 14

39 Gävle... L 15

244 Göteborg... O 10

24 Halmstad... P 11

56 Helsingborg... Q 10

12 Härnösand... O 16

7 Hudiksvall... K 16

8 Huskvarna... O 12

31 Jönköping... O 12

20 Kalmar... P 15

7 Karlshamn... Q 13

25 Karlskrona... Q 14

21 Karlstad... M 12

14 Kristianstad... O 12

12 Kristinehamn... M 11

19 Landskrona... Q 11

9 Lidköping... N 11

30 Linköping... N 14

11 Luleå... G 10

25 Lund... Q 11

128 Malmö... Q 11

9 Nässjö... O 13

61 Norrköping... N 14

12 Nyköping... N 15

38 Örebro... M 13

9 Oskarshamn... P 15

14 Östersund... I 13

8 Sala... M 15

7 Skara... N 11

11 Skövde... N 12

12 Söderhamn... K 15

14 Södertälje... N 16

502 Stockholm... M 16, Q 21

18 Sundsvall... J 15

13 Trelleborg... K 11

15 Trollhättan... N 10

15 Udevalla... N 10

11 Umeå... I 12

30 Uppsala... M 16

9 Varberg... P 10

30 Västerås... M 16

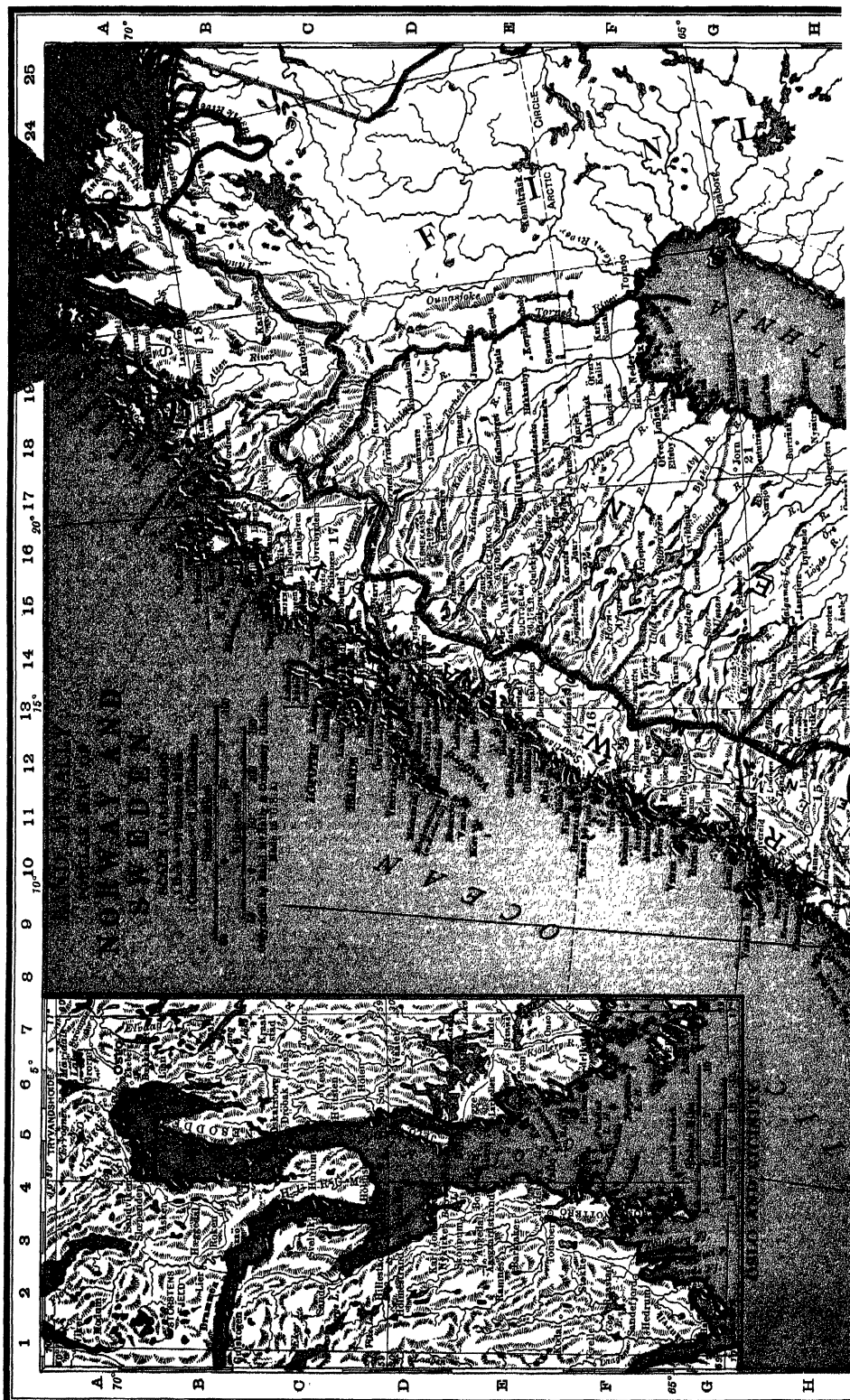
13 Västervik... O 16

9 Vänersborg... N 10

10 Vexjö... P 13

10 Viby... O 17

11 Ystad... R 12





# **NORWAY, FIJIAN OR PROVINCES.**

- 9 Vest-Agder
- 10 Rogaland
- 11 Hordaland
- 12 Sogn og Fjordane
- 13 Møre
- 14 Sør-Trøndelag
- 15 Nord-Trøndelag
- 16 Nordland
- 17 Troms
- 18 Finnmark

# **SWEDEN, LÄN OR DEPARTMENTS.**

- 1 Stockholm City
- 2 Norrbotten Län
- 3 Västerbotten Län
- 4 Uppsala Län
- 5 Gästrikland Län
- 6 Västmanland Län
- 7 Örebro Län
- 8 Västergötland Län
- 9 Göteborg Län
- 10 Bohus Län
- 11 Skaraborg Län
- 12 Jönköping Län
- 13 Östergötland Län
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- 25 Östergötland Län



ment and wood products. The country ranks with Switzerland and France in aluminum output, and is surpassed in this production only by the United States and Germany.

**Government.** The government is that of a democratic monarchy. The king exercises his functions through a council of state composed of a prime minister and at least seven other ministers. The legislature is in the hands of the *Storting*, or parliament, consisting of 150 members elected every three years directly by the people, and which cannot be dissolved by the king. He, however, has control over the land and sea forces. There are a High Court of the Realm, a Supreme Court and three courts of appeal.

**NORWAY, HISTORY OF.** While prehistoric remains indicate settlements going back as far as 6000 B.C., the Norwegians appeared on the scene of history only with the coming of the Viking age which began in the 9th century A.D. and lasted some 250 years. In the 9th century, the country was divided into more than a score of small kingdoms. It was temporarily united under Harald Haarfager, 860-933, who extended his rule to the Orkney and Shetland Islands; but upon his death disunion caused by contending chieftains prevailed. Iceland was discovered and settled at this time, 860 ff. Under Olaf, 996-1000, the work of Harald was continued for a few years; but his death opened the country to Swedish and Danish chiefs who divided it between them, and Norway was again united only under the rule of Olaf II, 1015-30, in whose reign Christianity began to gain ground. His rule was cut short by King Harthaknut of Denmark (d. 1042). Until the appearance of a strong military leader, Sverre, 1174-1202, Norway was more or less disturbed by contending claimants to the throne.

In the course of the 13th and 14th centuries, dynastic connections began increasingly to determine the course of political events in Norway. Haakon V, 1299-1319, married the daughter of Eric, the King of Sweden. Eric died without an heir, and Haakon's son, Magnus VII, 1320-65, became King of both countries. They were divided some 20 years later, however, and Norway fell to Magnus's younger son, Haakon VI. In 1343 he married the daughter of the King of Denmark, Waldemar III. The latter died in 1375 without male heirs. As a consequence Haakon's son Olaf became King of Denmark in 1376, and King of Norway in 1387. Olaf died while a minor in 1387. The Norwegian crown was thereupon offered to Margaret, the widow of Haakon who was already acting as the Regent of Denmark. The union of the two monarchies was broadened, in 1389, so as to include Sweden, and Finland also, when Margaret was offered the crown of Sweden. The so-called UNION OF KALMAR was formally effected in 1397 when the nephew of Margaret, Eric of Pomerania, was made King of the three countries. As far as Norway was concerned the union thus formed lasted, with temporary interruptions, till 1814, al-

though Sweden broke away from it in the 16th century.

It did not take long before Norway sank to the position of a Danish province. The officers of the realm were Danes, as a rule, and after the Crown had been made hereditary in Denmark, 1660, the Danish Stadtholder governed the country without Norwegian aid. Lutheranism was introduced, under Danish auspices, in 1539. Important matters, like foreign policies and questions of trade and commerce, were decided in accordance with Danish interests, and in the periodic, interminable wars between Denmark and Sweden, Norway was frequently the first to suffer. Hand in hand with this development, went a marked Danization especially of the upper classes. The result was, among other things, that Danish became the speech of the educated, and the Norwegian tongue tended to become the language of the untutored peasant. However, the condition of the peasantry remained better throughout than the condition of the Danish tillers of the soil who became bound to the soil and who were freed from virtual serfdom only in the closing years of the 18th century.

**Ceded to Sweden.** During the Napoleonic Wars, Norway suffered from the consequences of being a part of the Danish kingdom, and was drawn into the conflict on the side of the French. With the fall of Napoleon, Norway at once felt the weight of defeat. The King of Denmark, Frederick VI, 1808-39, was forced by Bernadotte, the Crown Prince of Sweden, to cede Norway to Sweden. The cession was embodied in the Treaty of Kiel, Jan. 14, 1814. This agreement made no mention of the Norwegian holdings, Iceland, Greenland and the Faroe Islands, and as a result, they remained with Denmark, much to the chagrin of the Norwegians.

The Peace of Kiel was resented by the Norwegians, who proceeded to make provision for their own future. The heir apparent of Denmark, Christian Frederick, who was then Danish Governor in Norway, was chosen to become King of an independent Norway. A constitution was also drawn up, Eidsvold, May 17, 1814. These enterprises were followed by a short war with Sweden, the Powers having failed to aid Norway and insisted that the union with Sweden be carried to its conclusion. The war was brought to a close by the Convention of Moss, Aug. 14, and in November of the same year the Norwegian *Storting* solemnized the union by selecting Charles John of Sweden as King of Norway.

While the union between the two countries was personal only, it was characterized by a good deal of friction almost from the beginning. The reasons were manifold. The heavy financial burdens imposed on Norway by the consequences of the recent international war led the *Storting* to refuse payments (they totaled some 12,000,000 kroner) in 1821, and a show of force was necessary to bring the legislature to terms. The attempt made by the King to obtain more than a suspensive veto over legislation led to several clashes in the 1820's. The Norwegians' insistence that May 17

be celebrated as a national holiday was another source of friction. Later on during the 19th century, more tangible matters introduced increasing heat into the relations between the two countries. The question of tariff legislation, and the problem of adequate foreign representation in particular (the foreign affairs of Sweden-Norway were conducted by Sweden) began to undermine the union. Finally the Norwegian Storting declared, in June 1905, that the union was at an end. The revolutionary action of the legislature was upheld two months later by a national poll in which the continuation of the union was condemned by a vote of 368,399 to 184.

**Becomes Sovereign State.** The final separation from Sweden came on Oct. 26, 1905, when King Oscar resigned the crown of Norway and formally declared the union ended. Having thus become a sovereign state, Norway proceeded to solve the matter of future government. A national referendum held on Nov. 13 resulted in a vote of 259,563 to 69,246 in favor of placing the Danish Prince Charles on the Norwegian throne. The new King arrived in Norway a couple of weeks later, and was solemnly crowned on June 22, 1906, as Haakon VII. The international position of the new kingdom was rendered more secure by the Treaty of Integrity, signed in 1907 by Norway, Great Britain, Russia, France, Germany and others, whereby the signatories agreed to respect and guarantee the territory of Norway.

During the World War, Norway's extensive shipping and other interests suffered greatly from the depredations of the warring powers, and Norway cooperated with Sweden and Denmark for the protection of the rights of neutrals. As an indirect consequence of the territorial settlements after the close of the war, Norway obtained Spitzbergen (Svalbard) in 1924, by which time all the interested states had ratified the Spitzbergen Treaty of Feb. 9, 1920.

The Norwegian Storting consists of 150 members, one-third of whom are chosen by the cities. Since 1869 it has met yearly. For the purpose of transacting business, the Storting divides itself into two parts. One-fourth constitutes the Lagtinget, and the remainder, the Odelstinget. Both meet separately; laws originate in the Odelstinget. If the two bodies fail to agree, they meet together (Stortingsplenum), and a two-thirds vote is required for decisions; they are not submitted to the king, who has only a suspensive veto. The right to vote was extended to most men in 1898, and to married and self-supporting women in 1907. Since 1913 all men and women over 25 years of age have had the right to vote. Proportional elections were introduced in 1919.

J. H. Wu.

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**NORWEGIAN DRAMA.** See SCANDINAVIAN DRAMA.

**NORWEGIAN LITERATURE.** See DANO-NORWEGIAN LITERATURE.

**NORWICH**, cathedral city and county town of Norfolk, England, lying in the valley of the Wensum near its junction with the Yare, 114 mi. northeast of London. An early royal borough, first destroyed and later restored by the Danes, it was one of the largest in England at the Conquest. Fragments of the 13th century city walls survive; the castle retains ancient earthworks, a Norman keep and tower; and ruins of a Benedictine nunnery lie to the east. About the cathedral are rows of gabled medieval buildings. St. Peter Mancroft's is considered the finest parish church in England. Lord Nelson, Raja Brooke, and George Borrow attended the 14th century grammar school. To-day, an industrial city of outstanding importance, Norwich has many modern public works and counts among its manufactures chemicals, lace, mustard and boots. Pop. 1921, 120,661; 1931, 126,207. See also NORWICH CATHEDRAL.

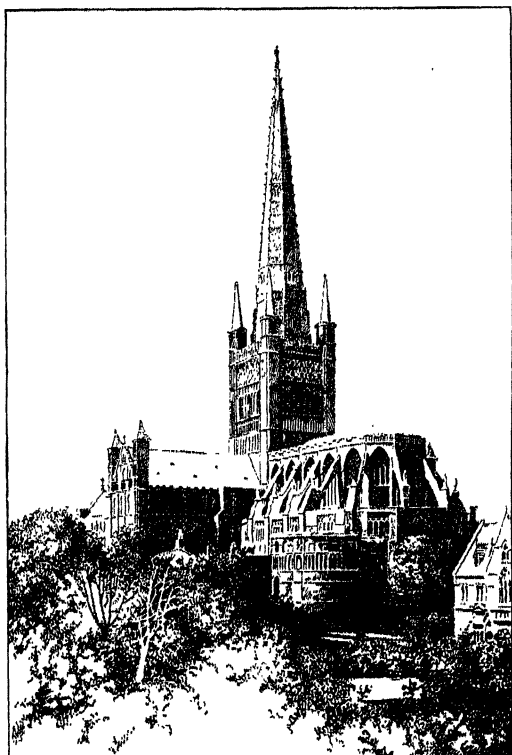
**NORWICH**, a city in southeastern Connecticut, one of the county seats of New London Co., situated at the meeting of the Yantic and Shetucket rivers to form the Thames, 95 mi. southwest of Boston. Bus lines and two railroads serve the city. Norwich is an industrial center, manufacturing chiefly textiles, machinery and iron products. In 1929 the factory output was approximately \$25,000,000; the retail trade amounted to \$15,733,514. The site of Norwich was bought from the Mohegan Indians in 1659. The city, within the town (township) of Norwich, was chartered in 1784, and again in 1877. Benedict Arnold was born here. Pop. 1920, 22,304; 1930, 23,021.

**NORWICH**, a city in southern New York, the county seat of Chenango Co., situated on the Chenango River, 42 mi. northeast of Binghamton. It is served by bus lines and two railroads. There is an airport. Dairying is the leading interest of the countryside. Pharmaceutical products, knitted goods and hammers are the principal manufactures; there are also railroad shops. Norwich was founded in 1788 and incorporated in 1816. Pop. 1920, 8,268; 1930, 8,378.

**NORWICH CATHEDRAL**, Norwich, England, in its present form, the most completely Norman of the English cathedrals. It was begun in 1096 as the church of a Benedictine abbey. Though damaged by fire in the 12th century, the cathedral has been little changed from its original plan. The nave, transepts, presbytery and the greater part of the aisles still stand as they were built when the church was completed in 1145, except that the nave and transepts were vaulted, and windows of the Perpendicular Style were inserted in the 15th and 16th centuries. The long nave, with 14 bays, contributes to the beauty of the interior, which has been called the finest Norman interior in England. The choir and cloisters were rebuilt after having been injured by fire late in the 13th century.

Two features give added charm to both the exterior and the interior of Norwich cathedral. The first is

the Norman central tower, with a graceful spire, which lights the church within from an open lantern resting on lofty arches at the crossing. The second is the unusual apse, where rounded chapels flank the straight east end.



NORWICH CATHEDRAL  
View of tower, spires and apse

**NORWOOD**, a town and village in Norfolk Co., eastern Massachusetts. The village is situated near the Neponset River, 14 mi. southwest of Boston. It is served by the New Haven Railroad, Eastern Mass. Street Railway, Boston Elevated, and by motor buses. Norwood is an important printing and publishing center, with factories making printing ink and cloth binding. The manufactured output of the town for 1929 was worth about \$25,000,000. The Memorial Municipal Building, with a Tower containing the Tilton carillon of 52 bells is an architectural ornament of the town. The site of Norwood was once sections of Dedham and Walpole. The town was incorporated in 1872. Pop. 1920, 12,627; 1930, 15,049.

**NORWOOD**, a city of Hamilton Co., O., a suburb immediately northeast of Cincinnati. It is served by the Baltimore and Ohio, the Pennsylvania, and, for freight, the Norfolk and Western railways, and by electric lines. Manufactures include playing cards, stationery, office furniture, safes, electrical goods, pianos, tools and house furnishings; printing and lithographing are also important locally. In 1929 the value of manufactures was about \$118,000,000; the

retail trade amounted to \$14,224,799. Originally called Sharpsburg, Norwood was settled about 1798, became a town in 1873, was incorporated as a village in 1888, and made a city in 1903. Pop. 1920, 24,966; 1930, 33,411.

**NOSE**, the organ situated in the middle of the face, which serves as the organ of the sense of smell and as the chamber through which air passes during respiration. Though man has but a slightly developed sense of smell, this function of the nose is in many animals the more important.

The nose consists of two cavities separated by a bony and cartilaginous septum. These cavities open in front to the exterior by means of the nostrils; in back they become continuous by the conchae with the pharynx, into which the mouth also opens.

The septum of the nose is quite smooth and regular, but the side walls are modelled by three horizontal scroll-like plates on each side, which project their free edges into the nasal cavity. These are the conchae: superior, middle, and inferior. The spaces between the conchae and the side wall are the superior, middle, and inferior meatuses. The accessory nasal sinuses open into the side wall, under cover of the conchae, into the meatuses. These sinuses are cavities in the bones of the SKULL which border on the nose.

The sinus in the sphenoid bone opens on the back wall of the nose at the level of the superior concha. Those in the ethmoid bone open into the superior meatus. Those in the frontal and maxillary bones open into the middle meatus. The naso-lacrimal duct, which carries away the excess of the fluid which bathes the eyes, opens into the inferior meatus.

At the upper part of the nose, both on the septum and lateral walls are the termination of the olfactory nerves, which mediate the sense of smell. *See also* EAR, NOSE AND THROAT, DISEASES OF; POLYPUS; SINUS AND SINUSITIS.

W. J. S. K.

**NOSY-BÉ**, or **NOSSI-BÉ**, Africa, a volcanic island 8 mi. off the coast of Madagascar, of which it is a dependency. The island is fertile, occupies an area of 130 sq. mi., and rises to a height of about 1,500 ft. at its loftiest point. Its principal town is Hellville, an important port with a fine harbor. An active trade is carried on particularly in tobacco, rum, coffee, sugar and vanilla. Pop. 1926, 14,022.

**NOTARY** or **NOTARY PUBLIC**, an officer who attests and certifies documents and in commercial law protests notes and bills of exchange, notes foreign drafts, and attests marine protests in case of loss and damage. In the United States notaries take and certify to acknowledgments of loss and conveyances and administer oaths. They are usually appointed by the Governor of the State.

**NOTATION**, in music, a system of symbols by means of which tones may be indicated in writing. To one familiar with modern staff notation the invention of such a device seems simple; the history of music nevertheless offers ample evidence that an adequate system of musical notation was developed only



at the cost of tedious experiment. Several hundred years were necessary to perfect the system now in universal force, and its remarkable simplicity is only the logical nature it finally and painfully acquired through the combined toil of many musicians.

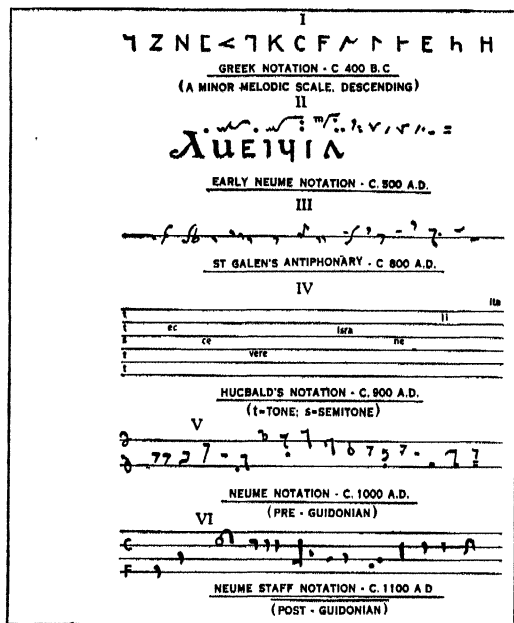
Originally, in early Greek music, the names of individual tones were derived from the names of the strings which produced them, and the names of the strings (for example, of the lyre or trigon) were solely descriptive titles. The longest string thus was called *hypate* or highest while the shortest string was called *nete* or lowest, intermediate strings bearing

dent; and the want of harmony in Greek music probably was caused to a great extent by this circumstance. Limited though it was, however, the alphabetical system survived for many centuries, being borrowed by the Roman Empire and being used throughout Europe during the early part of the Christian era. Meanwhile, as the musical ambitions of the Church developed, some superior system became progressively more important; furthermore, the accumulation of liturgical texts taxed the ingenuity of ecclesiastical composers who, challenged by the emotional flexibility of the liturgy, could hardly content themselves with a single tone to a single syllable. Accordingly there arose during the Dark Ages that superior, although still highly limited, system of symbols called NEUME notation, a neume being an arbitrary sign placed over a word or syllable and indicating the inflection of the voice singing it. Such a system was manifestly defective since it was a general guide rather than an exact one; but with the multiplication of neumes having various meanings—the *virga* (/) indicating an ascent of one tone, the *scandicus* (f) indicating an ascent of three or more tones, the *clivis* (Λ) indicating a descent of one or more tones, and so on—some degree of uniformity developed; and when at last, about 900 A.D., a single line was drawn straight across the page in order to indicate a fixed tone above or below which the neumes were inscribed when calling for tones higher or lower than that fixed standard, then the basis of staff notation was enunciated. A second line presently was added, whereupon GUIDO D'AREZZO virtually completed the picture by adding two lines more and producing the four-line staff, still used in ecclesiastical music. To him is commonly ascribed the invention of the staff; however, he merely put on the finishing touches, for his predecessor HUCBALD developed a multiple-line staff a full century earlier.

About 1000 A.D. only the pitch of notes was considered of great importance, since their value or duration was determined by the metrical characteristics of the text chanted. However, about 1100, the advantage of fixing the value of a tone as well as its pitch began to be recognized, and in the next two centuries there were hence developed the *maxima* (≡), *longa* (⌒), *brevis* (≡), and *semibrevis* (◊), which were supplanted about 1400 by corresponding notes written in outline, namely, the *maxima* (⌒), *longa* (⌒), *brevis* (◊), and *semibrevis* (◊). The latter was the parent of the present-day whole note (○), while the forerunners of modern notes of smaller value were the *minima* (♩), *semiminima* (♪), *fusa* (♫), and *semifusa* (♬).

The salient stages through which musical notation has passed during the last thousand years offer one of the most interesting instances of intellectual evolution on record; therefore, before coming to a brief survey of the finished product that issued from that long struggle, a few illustrations of this upward climb are here appended:

Respecting modern staff notation now in force



SCHEMES OF MUSICAL NOTATION

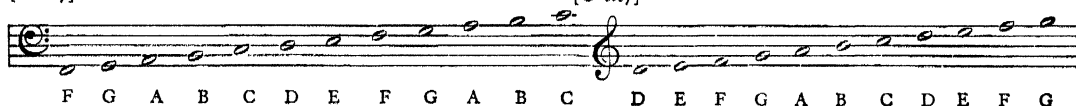
their own descriptive titles with reference either to the terminal strings or to the particular finger which naturally would pluck them. Since the longest or highest string would produce what we term the lowest tone, and the shortest string would produce the highest tone, it will readily be seen that the early Greek method of referring to strings rather than to tones made their nomenclature the reverse of our familiar one.

The foregoing system seems to have been in force for a considerable period, but as it obviously was an exceedingly cumbersome system it was supplanted by letters of the alphabet which referred directly to tones of various pitches. A two-octave system of tones, symbolically represented by letters taken from the Græco-Phœnician alphabet, gradually developed about 500 B.C. and was accepted as a general standard, variations in the system being indicated by certain modifications of the letters or by turning them on their sides and even inverting them. While for melodic purposes such a system was reasonably satisfactory, the impossibility of indicating harmony is painfully evi-

throughout the western world, three characteristics are outstanding: 1. the staff itself, 2. the clef, and 3. the signature. The **STAFF** is a group of five parallel lines, on which and between which the notes are written; the **CLEF** is a symbol indicating the pitch of one of the lines and hence the pitch of all other lines and spaces; the **SIGNATURE** is a variable number of symbols called sharps or flats which are placed at the beginning of a composition, not in the key of C-major (a key which has been selected as a standard). The function of the latter is to modify, by raising or lowering, the pitch of certain lines or spaces. The lines and spaces are named after the first seven letters of the alphabet (A-G inclusive) which are repeated cyclically when that alphabetical system is exhausted (see **MUSICAL NOTES**). While the staff indicates the pitch of the notes, their shape is entirely responsible for their duration. Two clefs are in most frequent use, the G or treble clef and the F or bass clef (see below). The former, placed on the second line of the staff, indicates that the second line is G, while the latter, placed on the fourth line of the staff, indicates that the fourth line is F in the **OCTAVE** lower. The following illustration, based on the use of both these clefs, clarifies the foregoing explanation:

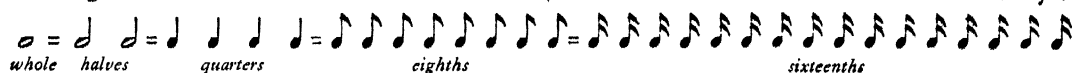
[F clef]

[G clef]



Since the intervals E—F and B—C are smaller than the intervals between all other adjacent lines and spaces, modifying certain lines and spaces becomes necessary when a scale having the same structure as the standard C scale, but beginning on any note but C, is to be constructed. Those modified lines and spaces are then called, not by their normal alphabetical names but, if raised, A sharp (A $\sharp$ ), B sharp (B $\sharp$ ), etc., and, if lowered, A flat (A $\flat$ ), B flat (B $\flat$ ), etc. When similar modifications take place during the course of a composition, the modified notes are called accidentals.

Respecting the duration of the notes, which are sounded simultaneously when placed above one another, and successively when written otherwise, the following chart shows their relative value:



As for meter, this is indicated at the beginning of a composition by fractions, the numerator of which indicates the number of notes, of a certain value, in a measure, while the denominator indicates the notes that are referred to; thus,  $\frac{4}{4}$  indicates that there are four quarter-notes in a measure,  $\frac{3}{4}$  indicates that there are three quarter-notes in a measure, and so on, the measures being indicated by vertical lines drawn through the staff and called bars.

**NOTE**, in music, a symbol designating a tone having a certain pitch and duration. Its pitch is determined by its position on the staff while its shape determines its relative durational value. See **MUSICAL NOTES**; **PITCH**; **STAFF**; **TONE**; **NOTATION**.

**NOTE**. See **BANK NOTE**; **BILL OF EXCHANGE**; **COMMERCIAL PAPER**.

**NOTKER BABULUS, ST.** (10th century), church musician, was born about 840 in northern Switzerland. He became a monk in the Swiss abbey of St. Gall. He was called *Babulus* or *Stammerer*, but nevertheless showed unusual proficiency in church music as the composer of the famous *Sequences* in the Liturgy. Recognized as the greatest musician of his age as well as the author of a celebrated *Martyrology*, he died at St. Gall about 912. Notker was canonized in 1513 and his day is kept on Apr. 6.

**NOTRE DAME, THE CATHEDRAL OF**, in Paris, probably the best known of French Gothic cathedrals, is of marked importance in architectural history, both for the influence it exercised upon other church building in France and because it so clearly shows the progress of French Gothic architecture step by step from the 12th to the 14th century. It was begun in 1163 and was mainly completed by

1208, though the west front with its two towers was not finished until 30 years later, and the north and south portals date from the second half of the 13th century. The *ceinture*, or girdle, of chapels was added between 1240 and 1315. The deeply recessed façade is the most important, as it is the most impressive feature of the cathedral. Its three distinct stories, the three sections formed by the buttresses, its three portals and the massive, square towers are beautifully proportioned, although the towers have never been completed with the spires originally planned for them. In the 18th century Notre Dame suffered from tasteless alteration, and during the Revolution, when it was converted into a "Temple of Reason," it was seriously damaged. The statues of the façade and of the north and south lateral entrances are mostly re-

placements, although a few admirable examples of early Gothic sculpture remain. The cathedral as seen from the rear, with the flying buttresses of the apse, has a lightness that is in striking contrast to the solidity of the west front.

Interiorly, the nave of Notre Dame is flanked on each side by two aisles, which are prolonged to form a double ambulatory around the choir, the earliest example of this type of construction. Each aisle is bordered by a row of chapels, beyond which the short transepts do not extend. The semicircular apse, the

monocylindrical pillars which support the vaulting, and the galleries above the aisles are Romanesque in origin. The superb rose windows in the transepts and west front retain their 13th century stained glass.

**NOTRE DAME, UNIVERSITY OF**, a Catholic institution for men located at Notre Dame, Ind., is conducted by the Congregation of the Holy Cross, but is open to students of all faiths. It was founded in 1842 by the Very Rev. Edward Sorin. To the original College of Arts and Letters, there have been added colleges of Science, Law, Engineering and Commerce, and schools of Education, Fine Arts and Journalism. Several schools for the brothers, novices and young priests of the Congregation of the Holy Cross are affiliated with the university, and there are preparatory schools for Notre Dame in different parts of the United States. The institution had productive funds in 1931 totaling \$1,400,000. Among the 150,000 volumes in the library there are special collections of Danteana and Hiberniana. The university presents the Laetare Medal each year to some Catholic layman for distinction in some branch of learning. In 1931-32 there were 3,172 students and a faculty of 187, headed by the president, the Rev. CHARLES L. O'DONNELL.

**NOTRE DAME DE PARIS**, a spectacular romance of Paris in 1482, by VICTOR HUGO; published 1831. Dom Claude Frolo, archdeacon of the Cathedral of Notre Dame, falls insanely in love with a gypsy dancing-girl, Esmeralda, and in his jealousy makes her appear to have stabbed her lover, Captain de Chateaupers, a crime for which, though she is innocent, she is pronounced guilty. The beautiful gypsy is being led to the gibbet when suddenly Quasimodo, the mysterious hunchback bell-ringer of Notre Dame, swoops down and carries her inside the cathedral to Sanctuary. Dom Claude, after failing to gain possession of the girl, learns that thieves plan to rescue Esmeralda and turns this attack to his own base purpose. Thus Esmeralda is hanged just after discovering that she is the long-lost daughter of Mother Gudule, an old recluse; but the gloating Dom Claude is hurled to death from the cathedral tower by Quasimodo.

**NOTRE DAME MOUNTAINS**, a series of highlands in the province of Quebec, Canada, situated south of the St. Lawrence River. They are structurally a continuation of the Appalachian system which extends into the Gaspe peninsula to form the Shick-shock Mountains. The Notre Dame group which traverses the Eastern Townships of Quebec, has an average height of 1,500 ft. and consists of three parallel ridges about 25 mi. apart. The wide valleys between these ridges comprise an important agricultural, dairying and stock-raising area.

**NOTTINGHAM**, a city of England, capital of the county of the same name, situated on the Leen, near its junction with the Trent, at the southwest extremity of Sherwood Forest, 110 mi. northwest of London.

In the Middle Ages Nottingham laid the foundation of her cycle, motor and machinery industries of

to-day. Her smiths, working with the charcoal of Sherwood Forest to smelt their iron ore, became famous. The charcoal is now replaced by a great coal-field which perhaps more than any other in Britain is capable of future extension. Although the iron industry is again coming to the fore, the chief trade of Nottingham now is in hosiery and lace. The invention of the stocking frame by the curate of Calverton, a town near Nottingham, was followed by that of Strutt for manufacturing ribbed hose, and with the coming to Nottingham of Arkwright and Hargreaves, the inventors of spinning machines, the hosiery and cotton industries became firmly established.

The principal educational institutions are the University College, a technical school, the Bluecoat School, a school of art and a mechanic's institute. The magnificent University Park was completed in 1931. Wollaton Park and its mansion, Wollaton Hall, covering 744 acres, were purchased by the city from Lord Middleton in 1924. An arboretum covering 17 acres is a feature of the city. The castle which crowns the summit of a rock 133 ft. above the level of the Trent, was originally built by William the Conqueror as a means of overawing the outlaws frequenting Sherwood Forest. Dismantled during the Protectorate, it subsequently became the property of the Duke of Newcastle, who erected a large mansion on part of the site in 1674. This now contains an art museum and free library. Pop. 1921, 262,624; 1931, 268,801.

**NOTTOWAY**, a North American Indian tribe of the Iroquoian linguistic stock, closely related in language to the Tuscarora. They lived formerly on the Nottoway River in southeastern Virginia. They played no prominent part historically and are now entirely extinct.

**NOVAE**, or new stars, are stars that suddenly flare up to tremendous brightness, sometimes increasing their light 100,000 times in 24 hours. The cause of such an outburst is still unknown, but it may be conjectured that it is due to a sudden release of subatomic energy in the interior of the star, which may well be likened to an explosion. That the disturbance is not very deep seated and that it only involves a part of the star may be concluded from the rapidity with which they settle back to normal brightness. The average nova attains at maximum a luminosity more than 10,000 times greater than that of the sun.

**NOVALIS**, pseudonym of Friedrich von Hardenberg (1772-1801), a German writer. He was born at Wiedersedt, now in Prussian Saxony, May 2, 1772, and was educated at Jena, studied law and became auditor to the salt works at Weissenfels. He was mystic philosopher and a foremost poet of the Romantic School (see ROMANTICISM). The beautiful *Hymnen an die Nacht* was written after the death of his betrothed. Included in his publication are his *Geistliche Lieder* and the unfinished *Heinrich von Ofterdingen*, a work symbolic of its author's quest for the unity of religion, art and science. Novalis died at Weissenfels, Mar. 25, 1801.

**NOVA LISBOA**, New Lisbon, formerly called Huambo, the capital of Angola or Portuguese West Africa. It is a new town founded as a result of the construction of the Benguela railway and situated 266 mi. from the coast. Since 1928, when it was made the capital, it has grown remarkably and is now an active trading, railway and administrative center.

**NOVARA**, a city in northwestern Italy, the capital of the province of the same name, situated 30 mi. west of Milan, on an eminence between the Agogna and Terdoppio rivers. Novara is dominated by the modern dome of the Church of San Gaudenzio. The cathedral, dating originally from the 4th century, was later remodeled in Romanesque style. Nearby is an early Christian baptistery, a city hall of the 13th century, a former market hall, or *mercato*, and several monuments, including one of Charles Albert of Sardinia, who was defeated near Novara in 1849. He abdicated immediately in favor of his son, Victor Emmanuel II, the future king of Italy and died in Portugal a few months later. The chief manufactures are textiles, organs and machinery. The city is a market for the agricultural products of the vicinity, especially rice. Novara is the seat of a bishop and a prefect, and has an episcopal seminary with a library, also a technical institute, trade schools, an art school and a museum. The ancient *Novaria*, Novara played a considerable rôle among the cities of Lombardy in the Middle Ages, until it came under the rule of Milan. With the latter it fell to Spain, and in 1714 to Austria, but was ceded to Sardinia in 1738. Pop. 1931, 63,211.

**NOVA SCOTIA**, a province of Canada composed of the peninsula proper and the adjoining island of Cape Breton, which is separated from the mainland by the strait of Canso. Nova Scotia is almost surrounded by the Gulf of St. Lawrence, the Atlantic Ocean and the Bay of Fundy, being connected with New Brunswick by a narrow isthmus 13 mi. wide.

**Area and Surface.** The total area of the province is 21,428 sq. mi. Cape Breton has an area of 3,120 sq. mi. The peninsula is 268 mi. in length from southwest to northwest, and Cape Breton is 108 mi. long. No large mountains occur. A range of hills traverses the peninsula, the eastern side being generally rocky, with lakes and streams, and the western part of a region of timbered hills. Cape Breton is hilly in the north, but low and level in the south.

**Inhabitants.** Most of the inhabitants are of Canadian birth, and of British or French ancestry. The predominating strains east of Halifax and including Cape Breton Island are Scottish; west of Halifax, English, with settlements of French speaking fishermen and five Teutonic settlements on the Atlantic seaboard. Pop. 1921, 523,837; 1931, 512,846.

**Harbors and Lakes.** The rivers of the province are small; the mouths of some have been made into fine harbors. Nearly 100 harbors are officially recognized; the principal ones are at Halifax, Sydney and Yarmouth. The largest lakes are Rossignol, 20 mi. long, and Ship Harbor, 15 mi. long.

**Forestry.** Lumbering, long the chief industry, is still important, though pine has practically disappeared and the forest resources are estimated at less than 30,000,000 board feet. Spruce, balsam, hemlock, and poplar are plentiful, and are used principally in the manufacture of pulp. The hardwoods are beech, maple and yellow birch.

**Climate.** The sea modifies the temperatures of winter and summer; clear weather is the rule, although there are spring fogs on portions of the coast. Rainfall averages 45 in. The Gulf Stream runs parallel to the coast of Nova Scotia in a northeasterly direction and this influence together with other climatic factors keep the line of harbors open all year from Cape Breton to the Bay of Fundy.

**Fisheries.** Fishing is of great importance to this province; next to British Columbia, the fisheries are the most productive in Canada. Cod, lobsters and haddock make up about two-thirds of the annual revenue of from \$11,000,000 to \$15,000,000, with mackerel and herring next in importance. The canning of fish is a thriving industry on the Atlantic coast. Trout and salmon are found in the inland streams.

**Agriculture.** Oats, barley and potatoes are the chief crops, and wheat is also raised with success. Dairying has become important in the hilly country. The apple is the principal fruit, being grown in large quantities in Annapolis Valley; the 1929 crop was valued at over \$6,000,000. North Mountain separates Annapolis Valley from the Bay of Fundy, and gives protection from the northwest winds and fogs, and South Mountain forms the other side. The valley, called the Garden of Nova Scotia, is 80 mi. long and 10 to 15 mi. wide.

PRINCIPAL FIELD CROPS, NOVA SCOTIA  
1930 and Five-Year Average 1925-1929

Crop	Area	Yield Per Acre	Total Yield	Total Value
	acres	bu.	bu.	\$
Oats ..... 1930	115,200	33.6	3,867,000	2,127,000
Av. .... 1925-29	112,333	33.2	3,725,200	3,037,500
Barley ..... 1930	10,800	28.7	309,500	217,000
Av. .... 1925-29	8,290	27.3	226,240	270,280
		cwt.	cwt.	
Potatoes ..... 1930	31,200	107.0	3,338,000	2,670,000
Av. .... 1925-29	30,083	96.5	2,903,400	3,559,800
Turnips ..... 1930	15,800	178.0	2,812,000	1,125,000
Av. .... 1925-29	14,976	225.9	3,383,200	2,044,200
		tons	tons	
Hay and clover .. 1930	540,000	1.59	859,000	9,879,000
Av. .... 1925-29	521,351	1.67	870,200	10,305,800

**Minerals.** Coal mining is Nova Scotia's premier industry. The coal is bituminous, and in many cases suitable for blast furnace coke. The principal fields are the Sydney mines on Cape Breton Island, the Inverness field on the western shore of Cape Breton, the Pictou field on the mainland and the Cumberland field on Chignecto Bay to the northwest of the peninsula. Cumberland and Pictou counties produce coal valued at over \$26,000,000 annually. In 1928 coal

production of the province was 6,741,630 long tons valued at \$26,379,572. Up till 1867 gold mining prospered, but from then until 1929 there was a steady decrease in production. Gold occurs in quartz veins near Halifax, near Yarmouth, and in the Caribou district there are some small deposits. Iron mining in Nova Scotia began in 1825, when a charcoal furnace was built to handle ore from the Nictau-Torbrook area. The industry was carried on more or less irregularly from that time until the large steel plant, now in operation at Sydney, was built. In 1895 important deposits of high grade hematite ore were opened up at Wabana, Newfoundland, and they have furnished most of the ore to the mills at Sydney, although attempts have been made to develop local deposits. Gypsum mining operations in Nova Scotia are said to have begun about 1779 and they have continued since that time with increasing efficiency and output; production in 1928 amounted to 1,764,262 tons valued at \$971,736; a huge part of this crude gypsum went to calcining mills in the United States. The province is rich in limestones, largely quarried by the steel works for fluxes. Other minerals found are salt, antimony, lead, ocher, tin, zinc, sandstone and granite.

MINERAL PRODUCTION, NOVA SCOTIA, 1929

Item	Production	Value \$	Rank Among Provinces
Coal ..... tons	7,056,133	28,071,956	1
Gypsum ..... "	948,895	1,152,160	1
Salt ..... "	27,819	157,662	2
Clay products .....	.....	653,157	5
Lime ..... tons	42,001	154,187	6
Sand and gravel .. "	332,599	151,368	7
Stone ..... "	264,706	376,222	5
Other products .....	.....	187,741	—
Total all products ...	.....	30,904,453	5

**History.** Nova Scotia has had four other names: the Icelanders called it *Markland*, meaning woodland; it was known as Land of the Bretons by the seafarers of the 16th century; the Micmac Indians found this part of the continent so plentifully endowed that they bestowed a name signifying admiration, *Akade*, a land of plenty; the French adopted as the name of the whole peninsula and a portion of the continent to the west the name *Acadie*, or Acadia, and the immigrants were called Acadians; this name still clings to those of French descent who dwell in New Brunswick and Nova Scotia. The province came by its present name when Sir William Alexander secured from his king, James I, the right to colonize the peninsula, 1621. Alexander affixed the name New Scotland, or *Nova Scotia*, the Latin of the original charter.

Nova Scotia, which then included New Brunswick, was first colonized in 1604 by French settlers, who afterwards were almost entirely driven out by English colonists of Virginia who invaded the settlement. English and French attempts to colonize the country were successful. Cromwell took possession in 1654 and made it a province two years later. The country

was ceded to France in 1668 but was relinquished to Britain in 1713 by the Treaty of Utrecht. The French retained Cape Breton until 1763 when the island was added to the government of Nova Scotia, though again separated from 1784 to 1820. An influx of American Loyalists caused the detachment of New Brunswick and it was made a separate colony in 1784. Nova Scotia entered the Dominion of Canada, 1867.

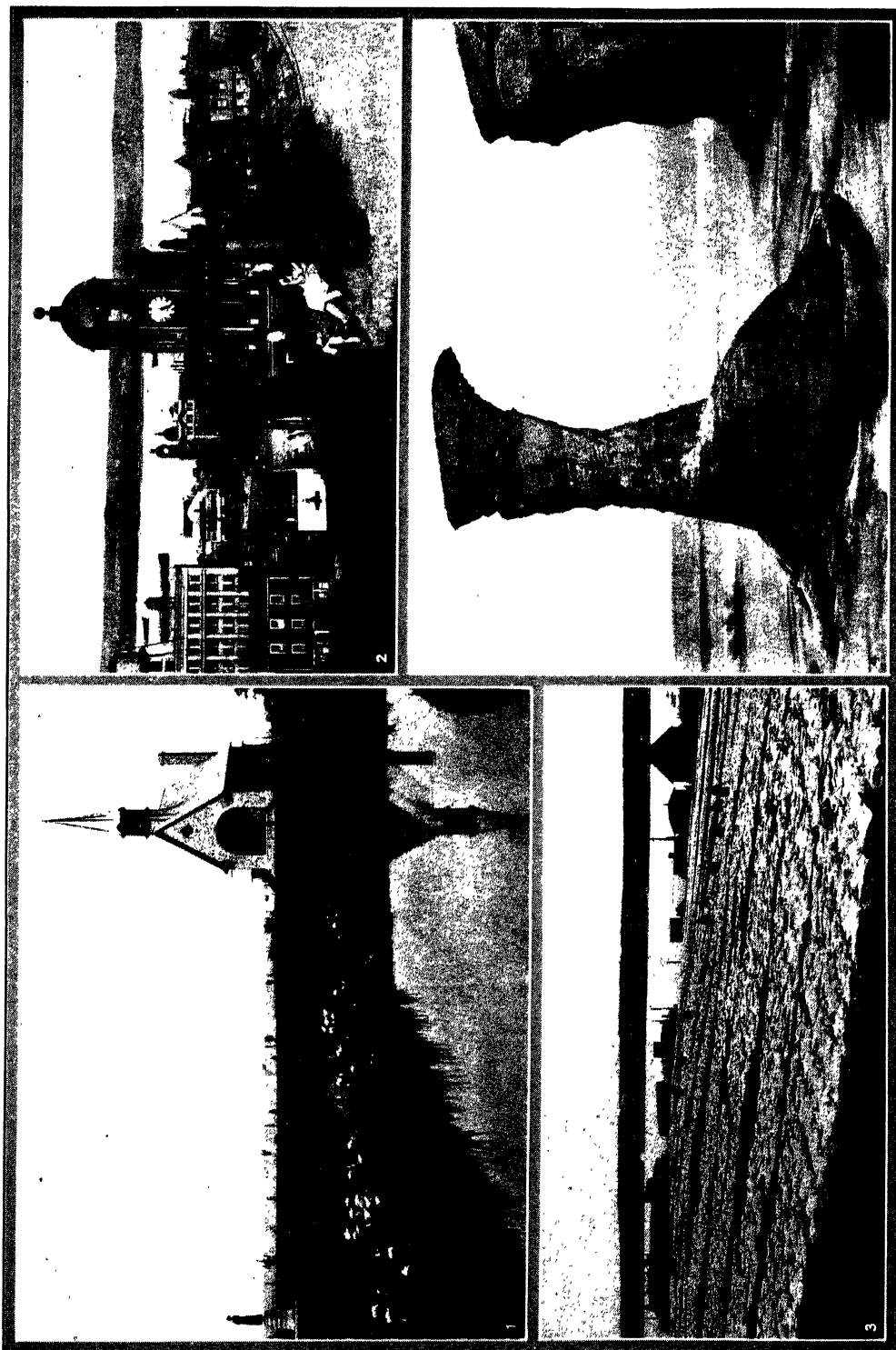
**NOVA ZEMBLA**, an Arctic land belonging to Russia, lying between the Kara and Barents seas. It measures 600 mi. in length and 60 mi. in average width, and is cut in two by a narrow strait, the Mattockin Shar, easily navigable by small vessels between July and October. The region is an extension of the Ural folded mountains, rising in places to over 3,500 ft. There is considerable area of relatively flat land cut by ice and river action and well indented by inlets of the sea, many of which are good harbors. A part of the interior has an ice-covering. The islands had no inhabitants until 1877, when Russia started a scheme of colonization. Families have settled and colonies have been formed. The settlers hunt bears and fish for salmon.

**NOVEL**, an imaginary narrative written in prose, in which the author seeks to excite interest, whether by arousing emotion, by portraying social customs, by delineating character, or by describing singular incidents. Although narrative fiction has apparently existed from the earliest times, the novel, as the term is understood to-day, is the latest arrival in the literary field, having been born as recently as the 18th century and possessing no direct roots in the literature of antiquity. It may depict many characters, as in the novels of THACKERAY and TOLSTOY, or the author may restrict them to four or five, as in the case of Hawthorne's *Scarlet Letter*. It may be concerned with incidents covering an extremely long period of time, or it may deal with those that take place within a year, a month, a week, or even, as has been done, a single day. The story may be told in the first person, by either the chief character or a subordinate one, or it may be told by the author, who assumes a god-like omniscience concerning his characters' emotions and inmost thoughts.

If the 18th century produced such brilliant storytellers as Defoe, Richardson, Fielding, Smollett, Sterne and Goldsmith in England, and Voltaire, Jean-Jacques Rousseau and Bernardin de St. Pierre in France, it was the 19th century that made the novelist supreme in popularity. This infant art, born overnight, leaped to the forefront of literature and became the chief literary expression of the great majority of writers who included Sir Walter Scott, Jane Austen, George Eliot, Dickens, Thackeray, the Brontë sisters, Meredith and Thomas Hardy. In France during the same century leading novelists were Dumas the Elder, George Sand, Balzac, Flaubert, de Maupassant and Zola.

In America this literary form was as quick to gain impassioned admirers. Novels arrived towards the latter part of the 18th century, and soon native Americans turned to the new medium. Sarah Went-

# NOVA SCOTIA



1, 3. COURTESY CANADIAN PACIFIC RAILWAYS; 2, 4. CANADIAN NATIONAL RAILWAYS

## HISTORICAL, INDUSTRIAL AND SCENIC VIEWS OF NOVA SCOTIA

1. Grand Pré Park in the Acadie immortalized by Longfellow's "Evangeline," showing the church in which the Acadians worshipped.
2. The old clock tower at Halifax.
3. Drying codfish at Digby, on the northwestern coast.
4. Lingan Rock in Cape Breton County.







## NEW BRUNSWICK

Area. 27,985 sq. m.  
Pop. .... 408,219

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

#### Pop.—Thousands

- 3 Bathurst... C 9
- 7 Campbellton A 7
- 4 Chatham... E 10
- 4 Dalhousie... A 8
- 6 Edmundston C 8
- 9 Fredericton... I 7
- 2 Grand Falls E 4
- 2 Marysville... I 7
- 2 Milltown... L 5
- 21 Moncton... H 12
- 2 New Castle... B 9
- 2 Sackville... I 13
- 1 St. Andrews... L 5
- 1 St. George... L 6
- 48 St. John... K 8
- 2 St. Stephen... L 5
- 2 Shediac... H 12
- 2 Sussex... J 10
- 3 Woodstock... I 4

#### Pop.—Hundreds

- 9 Hartland... E 4
- 9 Hillsborough... I 12
- 8 Petitcodiac... I 11
- 9 Shippigan... B 12
- 9 S. Devon... I 7
- 9 St. Leonards... D 4
- 9 Tracadie... C 11

## NOVA SCOTIA

Area. 21,428 sq. m.  
Pop. .... 512,846

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

#### Pop.—Thousands

- 7 Amherst... I 18
- 2 Antigonish... J 19
- 1 Bridgetown... M 10
- 3 Bridgewater... Q 12
- 2 Canso... K 22
- 9 Dartmouth N 15
- 1 Digby... N 9
- 3 Dominion... H 24
- 21 Glace Bay... J 24
- 50 Halifax... N 15
- 3 Inverness... J 21
- 3 Kentville... L 12
- 3 Liverpool... P 12
- 1 Lockport... Q 11
- 1 Louisbourg... J 24
- 3 Lunenburg O 13
- 9 New Glasgow... J 17
- 6 N. Sydney... G 24
- 2 Parrsboro... K 13
- 3 Pictou... J 17
- 1 Shelburne... Q 10
- 6 Springhill... J 13
- 5 Stellarton... J 17
- 23 Sydney... J 24
- 8 Sydney Mines... G 24
- 3 Trenton... J 17
- 3 Truro... K 16
- 4 Westville... J 17
- 3 Windsor... M 13
- 2 Wolfville... I 13
- 7 Yarmouth... Q 8

#### Pop.—Hundreds

- 6 Middleton M 11
- 6 Port Hood... I 20

## PRINCE EDWARD ISLAND

Area. 2,184 sq. m.  
Pop. .... 88,038

### PRINCIPAL CITIES

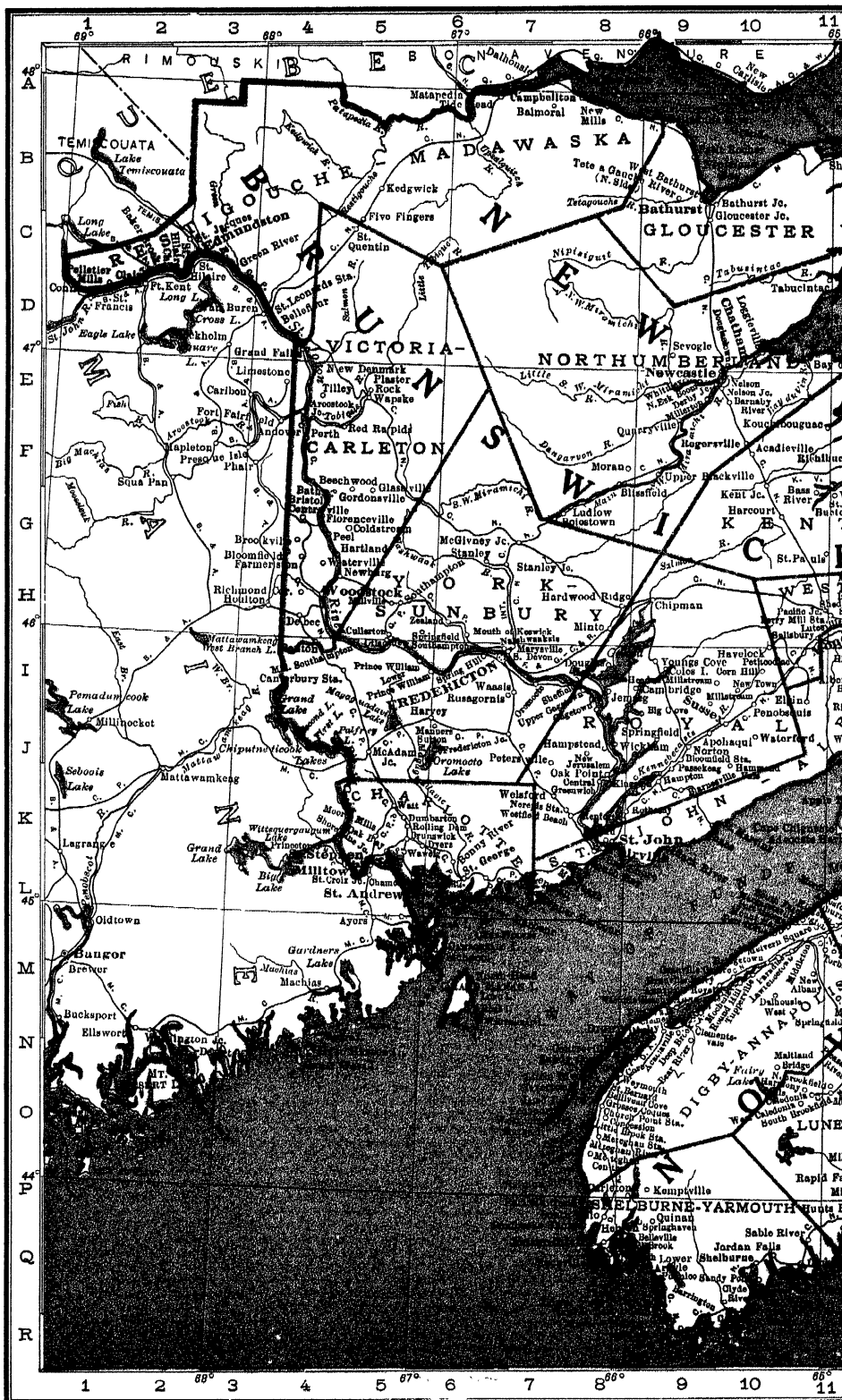
(Including Figures from Latest Population Estimates)

#### Pop.—Thousands

- 12 Charlottetown... H 16
- 1 Souris... G 18
- 4 Summerside... G 14

#### Pop.—Hundreds

- 6 Alberton... F 14
- 5 Cardigan... H 17
- 6 Georgetown H 18
- 6 Kensington... G 15
- 8 Montague H 17







worth Morton, Susanna Haswell Rowson, Hannah Webster Foster, Gilbert Imlay, Hugh Henry Brackenridge, Royall Tyler, Charles Brockden Brown—all wrote novels with varying degrees of success. A little later came another writer who earned unqualified popularity. This was James Fenimore Cooper. With him the real American novel and an outstanding American novelist arrived. Herman Melville next appeared with *Moby Dick*, one of the best novels of its kind ever written. Then came Nathaniel Hawthorne, whose *Scarlet Letter*, written in exquisite literary style, abounding in beauty and pathos, touched a peak in American literature. Washington Irving also attained international reputation, as did Mrs. Harriet Beecher Stowe with *Uncle Tom's Cabin*, although, in the latter's case, subject matter rather than literary art brought success. After the Civil War came Mark Twain, whose influence was tremendous. With the novels of William Dean Howells realism, though not of a sordid type, appeared in American literature. Henry James wrote sophisticated stories of Americans in Europe, and Mrs. Edith Wharton, one of the most finished of American writers, became his foremost literary disciple.

During the present century there has been a marked trend in American fiction towards realism and naturalism. Theodore Dreiser and Sherwood Anderson are both naturalists, while Sinclair Lewis, awarded the Nobel Prize in 1930, is a pronounced realist. See also separate articles on the above authors; AMERICAN, ENGLISH, FRENCH, RUSSIAN, GERMAN LITERATURE.

**NOVGOROD**, the administrative center of Novgorod district in the Leningrad Region of the R.S.F.S.R., in northwestern Russia. It is situated on hills above both banks of the Volkhov River in low-lying, flooded lands. Though the city has sawmills, shoe factories and brick works, its relative trade importance is past. Novgorod, called the "Museum City," was already powerful in the 9th century as a trade *entrepôt* between the East and West and Byzantium in the South. Here Russia was established in 862 when Novgorod summoned Rurik, founder of the Empire, to its defense. By the 11th century the cultural life of Novgorod dominated all Russia. From this time dates the Kremlin or fortress with its splendid Byzantine Cathedral of St. Sophia. The renowned Clock Tower therein was constructed later. In the 14th century Novgorod's population was estimated at 400,000; in the 16th century annexation to Muscovy by Ivan the Terrible and later war with Sweden effected the city's complete ruin. The St. Nicholas and Zameni cathedrals are outstanding among the multitude of public buildings, many of them dilapidated and decaying. Pop. 1926, 32,764.

**NOVIAL**, an INTERNATIONAL LANGUAGE invented in 1923 by the Danish linguist, Otto Jespersen, a former leader of the Idists (see *ESPERANTO*). He maintains that distinct terminations for the various parts of speech, etc., should be discarded as mere hindrances; and his vocabulary is based on the languages of western Europe, the words being formed by affixes.

Novial is one of the latest projects of this type, and as yet very little has been published in the language.

**BIBLIOGRAPHY.**—O. Jespersen, *Novial, an International Language*, 1929, and *Novial Lexike*, 1930.

**NOVICE**, one who undergoes the usual year of probation in a monastery or convent, under strict supervision and an ascetic mode of life, to qualify as a member of a religious order. At the end of this period the novice may either leave the cloister or "make his profession," that is, promise to live faithfully according to the rules, statutes and observances of the order. These vows are called solemn (*votum solenne*) when they are taken for life, and simple when they cover a fixed number of years or an indefinite time. No one may be admitted to the novitiate under 16 and, in many cases, under 20 years of age.

**NOVILARAN**, the language of three inscriptions, the longest containing 12 lines, found near Novilara, Italy. The texts apparently date from the 6th or 5th century B.C., and are written in an archaic form of the North ETRUSCAN alphabet, but are not yet satisfactorily interpreted. The language seems to have been INDO-EUROPEAN, perhaps of the ILLYRIAN group.

**NOVI SAD**, German *Neusatz*, a city of the former Vojvodina, YUGOSLAVIA, located about 160 mi. southeast of Budapest on the Danube. Silk, millstones, vegetables, fruits, wine and other liquors are the principal items of trade. Novi Sad, the base of a military district, of which Yugoslavia has five, has a large flying field near the city, and is also the seat of several educational institutions. In the days of the Austro-Hungarian Empire, the Serbians in Hungary made the town the center of religion and literature. At the close of the World War, Novi Sad was incorporated in the Yugoslav Kingdom. Pop. 1931, 63,966.

**NOVOCAINE**, a valuable local anesthetic, also called procaine hydrochloride. As the use of COCAINE for rendering anesthetic a site of operation produced certain injurious effects, and as the exact chemical conformation of the cocaine molecule was known, experimenters attempted to discover and remove the toxic portion of the molecule. As a result of their efforts, a number of new compounds were obtained which had the same depressing effect on nerve tissue but reduced side effects. One of these is novocaine. For some purposes, notably for relatively deep operations and for spinal anesthesia, novocaine has replaced cocaine. The latter drug, however, penetrates mucous membranes better and is preferred for operations on the nose and eyes.

**NOVO CHERKASSK**, a mountain city of the North Caucasian Region, in southeastern European Russia, situated at the junction of the Don and Axai rivers. It has a population remarkable for its high percentage of students and scientific workers, whose presence has made the city the cultural and scientific center of the North Caucasian Area. Cloth and machinery are important manufactures. There are four excellent educational institutes, a museum and li-

brary. Founded by the Cossack chieftain Platov in 1805, when the flooding of the Don caused him to transfer his headquarters to Novo Cherkassk from old Cherkassk, it became the administrative seat of the Don Cossack district. Novo Cherkassk was the last stronghold of the counter-revolutionists following the World War. Pop. 1926, 62,274.

**NOVOROSSISK**, a seaport city in the North Caucasian Region of the R.S.F.S.R., situated on the north-east coast of the Black Sea and connected by rail with BAKU, ROSTOV-ON-DON and other centers. Its once extensive trade in grain has diminished, and the city is now noted for its large cement works and agricultural machinery plant. The chief exports are cement, oil, tobacco and potash. Coal, coke and machinery are the main imports. Pop. 1926, 67,955.

**NOVO-SIBIRSK**, administrative center and the leading city of the Western Siberian Region of the R.S.F.S.R., situated in the southwestern part of this region on the River Ob over which there is a bridge for the Trans-Siberian Railway. The city is a shipping center for cargoes of metals and minerals from the Altai district and for the agricultural products of the steppe country surrounding it. Founded near the end of the 19th century by railway employees, the settlement soon developed into Siberia's commercial center because of its location on the railway and on Siberia's largest river. With Novo-Sibirsk as a central point, farming machines are distributed to all parts of Siberia; frozen meat and butter are shipped out also. The city has electric sawmills, flour mills, grain elevators and a large combine plant. Newspapers are published in the Russian, Tatar, Estonian and Latvian languages. Pop. 1930, 146,000.

**NOVUM ORGANUM**, a treatise in Latin by FRANCIS BACON, in which is outlined a scientific method for inducing truths from experiments and observation; published 1620. In this early attempt to lay the foundation of a scientific technique, the author introduces his theories by stating that four "idols" bar the way to man's progress towards truth: *Idola Tribus*, the idol of custom; *Idola Specus*, individual prejudice; *Idola Fori*, popular prejudice; and *Idola Theatri*, pleasant fictions. Bacon's outstanding contribution in the *Novum Organum* was his idea of form, which exercised a notable influence upon the philosophy of JOHN LOCKE.

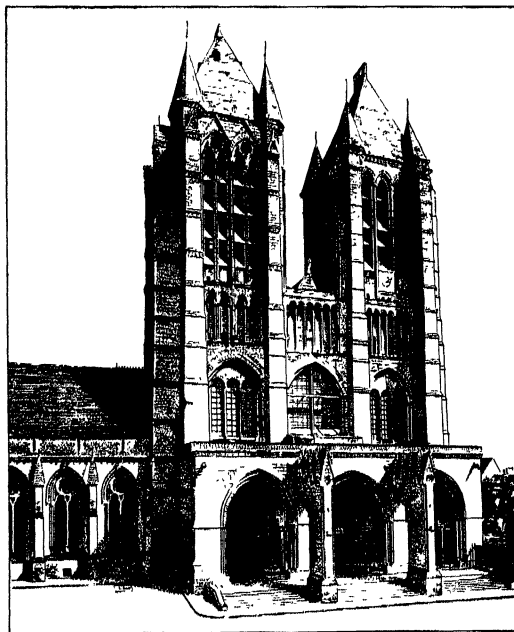
**NOX**, in Roman mythology, the equivalent of the Greek Nyx, daughter of Chaos and sister and wife of EREBUS, was the personification of night. She was mother of Aether and Hemera, also of the Furies, Fates (see EUMENIDES), and other children of both good and bad intent. She is represented in dark garments with wings which she spreads over the world to bring rest to man.

**NOYES, ALFRED** (1880- ), English poet and man of letters, was born in Staffordshire, Sept. 16, 1880, and educated at Oxford. His first book, a collection of poems, *The Loom of Years*, appeared in 1902. Two later volumes, *Forty Singing Seamen*, 1907, and *Drake*, 1908, show him to be specially

gifted as a poet of the sea. Among his numerous other books are *The Winepress*, 1913; *The Watchers of the Sky*, 1922, and *The Last Voyage*, 1930. Noyes lectured in the United States, and from 1914-23 was professor of Modern English Literature at Princeton. His works include fiction, essays and a poetic drama, *Robin Hood*, which was produced in 1927.

**NOYES, ARTHUR AMOS** (1866- ), American chemist, was born at Newburyport, Mass., Sept. 13, 1866. He graduated from the Massachusetts Institute of Technology in 1886 and in 1890 became instructor there, assistant professor in 1894, professor in 1899 and acting President from 1907 to 1909. In 1915 he became director of the Gates Chemical Laboratory of the California Institute of Technology. He devoted himself to the study of the laws of mass action in solutions and published a number of papers on that subject as well as works of a more general nature.

**NOYES, HARRY ALFRED** (1890- ), American research chemist, was born at Marlborough, Mass., July 7, 1890. In 1913 he became research assistant at Purdue University. He undertook research work with the Mellon Institute of Industrial Research in 1918 and in 1922 became cereal chemist of the Michigan Agricultural Experiment Station. In 1923 he joined the New Rochelle Research Laboratories. He specialized in the chemistry of soils and fruit juices and wrote a number of papers for professional journals.



CATHEDRAL OF NOYON  
West side, showing towers and the chapter house

**NOYON**, an old town in northern France, about 65 mi. from Paris. As king of Neustria, Charlemagne, crowned there in 768, lived in Noyon for several years. John Calvin was born in Noyon in 1509.

The town, captured by the Germans Sept. 1, 1914 and held by them until Mar. 1917, was almost completely destroyed. The cathedral of Notre Dame, an interesting structure of the late 12th and early 13th centuries, escaped ruin. It offers an unusual effect in its combination of Romanesque and Gothic arches; there is a 13th century cloister and chapter house of the same period. Pop. 1931, 6,609.

**NTLAKYAPAMUK**, an important Salishan-speaking Indian tribe, better known as Thompson Indians from the river in Canada on which they live.

**NUBIA DESERT**, in northeastern Africa stretches east from Lower Nubia to the Red Sea. It is situated east of the Nile, confronting the great western curve of that river. There are a few oases, producing dates and gums, the latter obtained from the acacias.

**NUCLEUS**, a concentrated bit of matter at the center of the **ATOM** which measures not more than a few million-millionths of a centimeter in diameter. Nearly all of the mass of the atom is in this nucleus, for the surrounding **ELECTRONS** weigh but little in comparison. The positive electricity of the nucleus results in a strong electrical field, and renders the stability of the nucleus very great. Further, the positive charge determines the number of electrons which surround it in the normal, neutral state of the atom, thereby determining the chemical properties of the substance.

The nuclear theory of the atom was first proposed by RUTHERFORD in 1911 as the result of studies of the scattering of **ALPHA PARTICLES** by various elements. He found it necessary to assume such an atom in order to account for those particles scattered at large angles from the direction of the incident beam. His theory, verified in great detail by Geiger and Marsden two years later, gave a value of two million-millionths of a centimeter as the closest approach of the alpha particle to the center of the atom. It also indicated that the charge of electricity on the nucleus, counted in electronic units, was approximately equal to one half the atomic weight of the atom. The work of Moseley on the frequency of the characteristic **X-RAYS** emitted by various anti-cathode (*see* **CATHODE**) materials proved that the more exact relationship was that the charge on the nucleus was numerically equal to the atomic number times the electronic charge. Thus, the charge of the hydrogen nucleus is equal to that of one electron, although of opposite kind. The charge of the second lightest element, helium, is equal to two electrons. The charges increase from the lightest to the heaviest element.

The mass of the hydrogen nucleus is equal to  $1.66 \times 10^{-24}$  grams, 1,850 times that of the planetary electron. The other nuclei are increasingly heavy, in proportion to their atomic weights. For example, since the atomic weight of helium is 4.002 and that of hydrogen is 1.008, the mass of the helium nucleus is  $(4.002/1.008) \times 1.66 \times 10^{-24} = 6.6 \times 10^{-24}$  grams.

Because beta particles, high-speed electrons, are spontaneously ejected from the nuclei of radioactive ele-

ments (*see* **RADIOACTIVITY**), it has been concluded that the nuclei are complex structures containing both positive and negative charges, with an excess of positive. Furthermore, hydrogen nuclei, called **PROTONS**, have been knocked out of practically all elements by bombardment with high-speed alpha particles. This indicates that all nuclei contain protons. Studies of the internal structure and stability of the nucleus constitute the frontier of physical research. J. B. H.

**NUEVO LEÓN**, a state of Mexico, lying on the northeast slope of the great central plain with an area of 25,032 sq. mi. It is traversed by the Sierra Madre Mountains, whose mean elevation is about 5,000 ft. above sea level, and whose eastern slopes are covered with magnificent forests. The most important of its numerous rivers are the Salado and the Pesqueria. The state is famous for its hot springs, the most famous of these being Topo Chico, near Monterrey. Nuevo León is one of the most progressive manufacturing states in Mexico, many of its manufactories being owned by American companies which operate smelters, cotton mills and iron and steel works. Fruit and other products grow in the lowlands. The capital is MONTERREY, and other cities are Linares, García and Jiménez. Pop. 1921, 336,412; 1930, 416,173.

**NUISANCE**, anything which unlawfully causes hurt, inconvenience or damage. The term is employed chiefly to denote uses of property which injuriously affect the property of others. Obstruction of easements, and the maintaining of things injurious to the public health, safety or morals. A public nuisance is one affecting the community at large; a private nuisance, one affecting a particular individual.

**NULLIFICATION, RIGHT OF**, the theory that a state may suspend the operation within its borders of a Federal statute which, in the state's contention, transcends the powers delegated to the National Government in the **CONSTITUTION**. It was formally asserted in the **VIRGINIA AND KENTUCKY RESOLUTIONS**, 1798, 1799, protesting against the **ALIEN AND SEDITION ACTS**, and was first practiced by Pennsylvania, 1809, in an attempt to prevent the enforcement of a decree of a Federal court. In the New England states statutes for the enlistment of troops in the **WAR OF 1812** were nullified by state action. A special convention in South Carolina, Nov. 24, 1832, declared the Federal tariff acts of 1828 and 1832 null and void, forbade the payment of duties at the state ports after Feb. 1, 1833, and declared that if the National Government attempted to interfere the state would consider its connection with the Union severed. After President Jackson had taken prompt measures to enforce the collection of duties in South Carolina, the other southern states had failed to endorse the action of South Carolina, and Congress had enacted a more acceptable tariff act, the ordinance of nullification was repealed Mar. 6, 1833. Other Federal legislation, notably the **FUGITIVE SLAVE LAW** and the **Constitutional amendments** providing for Negro suffrage, has been in practical effect nullified by the states. ARTHUR TWINING HADLEY and other opponents of the

Prohibition Amendment have advocated nullification as a legitimate relief.

**NUMANTIA**, an ancient town of Terraconensis, Spain, in what is known as Old Castile. It was built on a hill and was one of the strongest fortifications of its day. The Romans attempted to take Numantia several times, the struggle lasting from 154 to 133 B.C. Finally Scipio Aemilianus, after a protracted siege, captured the town and destroyed it, in the year 133 B.C. This was considered one of Rome's greatest victories. The village of Garray stands on the site.

**NUMBER**, in language, a category of nouns, adjectives, pronouns and verbs which indicates reference to one, two, or more than one (or two), the relevant designations being singular, dual and plural, and each possessing originally a distinct type of INFLECTION. The singular falls into three types: unitary (man as a single individual; "the man runs"), generalized (man as a type; "man is mortal") and collective ("mankind," i.e., all human beings taken together).

There is some reason to suppose that the singular alone was known in the earliest periods; many languages form their plurals by simple reduplication of the singular, (as MALAY *būdaq* "child," *būdaq-būdaq*, "children"), or by words meaning "many," "people," etc. (e.g., Hindi *bandar-lōg*, "monkeys" = Sanskrit *vanara-lōka*, "wood-people"). The inflection of the plural is much less complete than that of the singular, and the endings are sometimes the same in both (e.g., Sanskrit *ah-ām*, "I," *vay-ām*, "we," *mā-d*, "from me," *asmā-d*, "from us"); a collective singular is often felt to be a plural ("His Majesty's Government are"), or a (neuter collective) plural may, as in GREEK and AVESTA, take a verb in the singular.

Apparently the plural arose through desire to indicate a plurality as composed of individual beings or things rather than as a group, so that Latin *servi* would originally have meant "slaves" taken individually, and *servitium* "slaves" as a group (cf. French *service*, "group of servants"). The dual, which survives only in Indo-Iranian, Tokharian, Greek, Old Irish, Gothic, Baltic and Slavic (see these separate titles), with sporadic traces elsewhere (e.g., Bavarian German *ös, enk*, "we two, you two"; Latin *duo*, "two," *ambo*, "both"; English *two*—the sole remnant here), in origin probably denoted natural pairs, as eyes, tongs, etc., though later it was used of any pair of two, as Sanskrit *ācāvau*, "two horses." Its inflection is from the start so incomplete that conjectures concerning it are highly problematical.

In SEMITIC, especially in ARABIC and ETHIOPIA, the regular formation of the plural is in large part superseded by the "broken plural." In form this is a feminine singular (see GENDER), and it governs its verb in that gender and number. Though having a plural force, it is in reality a collective singular. The alleged existence of "trial" and even "quadrial" numbers ("they three," "they four") in MICRONESIAN (cf. MELANESIAN) seems ill-founded; but here as in POLYNESIAN there is a true quasi-number in inclusive and

exclusive forms for the pronoun of the first person plural ("we, including you," "we, but not you").

L. H. G.

**NUMBERS, BOOK OF**, derives its name from its Latin title, *Numeri*, and in the chronology of the Pentateuch, embraces about 38 years. It relates the story of the wanderings of the Israelites in the wilderness, and the laws given to them there. In it are found the stories of the hostilities of the Amorites and Moabites, the dispatch of the spies to view Canaan, the story of Balaam's ass, and the appointment of Joshua as the successor of Moses. The work is assigned by most modern scholars to a post-Mosaic period, at least 600 years after the settlement of the Hebrews in Palestine. Although its 36 chapters are not read as often as other parts of the Bible, it has numerous notable passages and sayings, not the least being the great benediction, "The Lord bless thee and keep thee, . . . and give thee peace."

**NUMBERS, THEORY OF**. Originally the word number referred to the common sequence of integers, 1, 2, 3, . . . . It is probable that it soon became looked upon as referring to both ordinal numbers, as 1st, 2d, 3d, . . . , and cardinal numbers, as one, two, three, . . . . Much later its meaning was extended to include, apparently in about this order, such concepts as unit fractions,  $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots$ ; other fractions,  $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots$ ; surds,  $\sqrt{2}, \sqrt[3]{120}, \dots$ ; negative numbers,  $-1, -5, -\frac{3}{4}, -\sqrt{3}, \dots$ ; zero, 0; imaginaries,  $\sqrt{-1}, \sqrt{-7}, 3\sqrt{-2}, \dots$ ; complex numbers,  $-\frac{3}{4} - 2\sqrt{-1}, \frac{5}{8} - 6\sqrt{7} \cdot \sqrt{-1}$ ; transcendental numbers,  $\pi, e, \sin 7^\circ, \log 2, \dots$ ; and other types. There are five fundamental laws relating to integers. Using algebraic notation, these are:

$a + b = b + a$ , the commutative law of addition;  
 $ab = ba$ , the commutative law of multiplication;  
 $(a + b) + c = a + (b + c)$ , the associative law of addition;  
 $(ab)c = a(bc)$ , the associative law of multiplication;  
 $a(b + c) = ab + ac$ , the distributive law.

As the number field expands, new numbers, like surds, are generally admitted with such a meaning as makes them conform to these laws.

The theory of numbers was formerly confined to positive integers, as with the Greek philosophers, but at present the negative integer is also included. The theory of numbers considers the peculiar properties which they possess. To take four very simple illustrations, (1) the sum or the difference of two odd numbers is always an even number; (2) the product of any two consecutive numbers is always even; (3) the product of any three consecutive numbers is always divisible by 3; and (4) the product of any  $n$  consecutive numbers is always divisible by  $n$ . Two of the interesting propositions in the theory of numbers are described in the articles entitled STIRLING NUMBERS and FERMAT'S THEOREM. See also PRIME



NUMBER; ARITHMETIC; AMICABLE NUMBERS; ABUNDANT NUMBER; DEFICIENT NUMBER; MATHEMATICS.

D. E. S.

**BIBLIOGRAPHY.**—The standard work on the history of the theory of numbers is that of L. E. Dickson, *History of the Theory of Numbers*, 3 vols., 1919, 1920, 1923. Consult also the same author's *Theory of Numbers*.

**NUMERALS.** The simplest way to indicate a number in writing is by making the proper number of lines much as we keep score in a game, but this leads to confusion as the size of the number increases.

BABYLONIAN									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470
471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490
491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590
591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710
711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730
731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790
791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830
831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860
861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890
891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910
911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970
971	972	973	974	975	976	977	978	979	980
981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000

FIG. 1. ANCIENT NUMBER SYSTEMS BASED ON REPETITION OF CHARACTERS

The Egyptian hieroglyphic form was used in inscriptions while the hieratic was better adapted for writing with a brush or reed pen

In the Egyptian and Babylonian numerals (Fig. 1), the number of repetitions of any one character need not exceed nine, for number forms existed for 1, 10, 100, and 50 on. In the Herodianic Greek numerals (Fig. 2) the number of repetitions of the symbols was limited to four by the introduction of characters for

1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900	1000
Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	Α	Β	Γ	Δ
1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900	1000
Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	Α	Β	Γ	Δ

FIG. 2. HERODIANIC AND ROMAN NUMBER SYMBOLS

5, 50, and 500. The Romans (Fig. 2) abridged certain numbers even more by such forms as IX, that is one less than ten, instead of VIII, or four more than five, but they were not consistent in their use of this subtractive principle.

1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A
1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A

FIG. 3

In another system of Greek numerals (Fig. 3) the letters of the alphabet represented units from one to nine, multiples of 10 from 10 to 90, and multiples of 100 from 100 to 900. As the Greek alphabet con-

tained but 24 characters and as this system required 27, three additional symbols for the numerals 6, 90 and 900 were introduced. (See table.)

In the Hindu-Arabic numerals, the presence of a zero makes the "place value" idea possible and it allows us to write any number whatever by the use of nine symbols besides the zero. Thus where the Greek alphabet system required separate characters for two, twenty, and two hundred, in the Hindu-Arabic system these are written as 2, 20 and 200, the zeros after the 2 indicating the "place value" of each of the 2's.

1	2	3	4	5	6	7	8	9	0	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900
Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	Α	Β	Γ	Δ
1	2	3	4	5	6	7	8	9	0	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900
Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	Α	Β	Γ	Δ

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FIG. 4. HINDU-ARABIC NUMERALS FROM THE 10TH TO THE 16TH CENTURIES

The Hindu-Arabic numerals may be traced to inscriptions of King Aśoka in India (3d century B.C.), but these numerals lacked the zero, which was a later invention. The numerals without the zero seem to have been known to European scholars in the 10th century. The system with the zero was introduced into Bagdad in the 9th century or perhaps earlier, and reached Christian Europe prior to or during the 10th century. Some of the many changes in these numerals are indicated in Fig. 4.

It was not until the 16th century that the system was completed by the invention of the decimal fraction (*see* DECIMALS) which made use of



lowed by 21 ciphers. See ARITHMETIC; NUMBER, THEORY OF; FINGER NUMERALS. V. S.

BIBLIOGRAPHY.—D. E. Smith and L. C. Karpinski, *The Hindu-Arabic Numerals*, 1911; D. E. Smith, *Number Stories of Long Ago*, 1919; *History of Mathematics*, vol. II, 1925; F. Cajori, *History of Mathematical Notations*, vol. I, 1928; Vera Sanford, *Short History of Mathematics*, 1930.

**NUMEROLOGY**, a system of interpreting human fate in terms of the good or ill fortune associated with numbers. Three and seven carry special fates. Acts or formulae must be repeated three times to secure the magical effect. The seventh son of a seventh son was supposed to be endowed with the gift of prophesy. The harmony of the spheres as set forth by Pythagoras is looked upon as a philosophic sanction of the cosmic significance of number. The Kabbalah or mystic occult system of philosophy likewise proceeded upon the same principle.

The system was much extended by transforming names into numbers, according to their position in the alphabet, assigning them from 1 to 9 (A to I, J-R, S-Z), adding the result, and throwing out tens until a single digit is left. Other elaborations have been added. The system is completely fanciful and represents a pseudo-science built upon crude superstitions.

**NUMIDIA**, the central portion of northern Africa originally divided from Mauretania on the west by the River Malva and from the territory of Carthage on the east by the River Tusca. The name suggests a nomadic people who inhabited the region. Under Masinissa the country obtained its greatest extent of territory, surrounding Carthage on both sides and covering the region between the Molucha on the west and Cyrenaica on the east. Masinissa was a typical Numidian, fearless and treacherous; he had been richly rewarded by the Romans for his aid against Carthage. He lived to a ripe old age, and upon his death his kingdom was divided among his three sons; the land, however, was soon reunited under one son, Micipsa, on the death of his two brothers. In 46 B.C. Numidia was made a Roman province.

**NUMISMATICS**, the science treating of the origin, history, and significance of coins. The use of coins as a monetary means of exchange probably began on the coast of Asia Minor about the 9th or 8th centuries B.C., although tokens made of shell, leather, wood and other materials were employed much earlier. The history of numismatics begins with the early Greek coins of Lydia, which were made of electrum, a gold and silver mixture. Silver, bronze and copper were current metals in the coinage of Rome, beginning about 338 B.C. Nero was the first in recorded history to use alloys to debase coins, and Julius Caesar was the innovator of portrait coins, i.e., coins bearing the likeness of an individual. Medieval coins brought a return to the gold and silver currency of the Greeks, and under the Renaissance monetary tokens improved in design and workmanship. In modern times the trend in coin minting has been toward fewer denominations, made possible by the expanding credit structure of the world. Numismatics may be described as

a branch of universal history, many important dates in which have been determined by the inscriptions and designs engraved upon coins unearthed by archeologists. See COINAGE.

BIBLIOGRAPHY.—B. V. Head, *Historia Numorum*, for Greek coins; G. C. Arnold, *Numismatic Guide*; H. Wood, *Commemorative Coinage of the United States*.

**NUMMULITIC LIMESTONE**, massive, reeflike Eocene beds, several thousand feet thick, chiefly composed of the disk-shaped fossil shells of large marine foraminifers, called Nummulites, from the Latin *nummulus*, a coin. The coiled, flattened shells range from ½ in. to 2½ in. across. These beds raised to elevations of 10,000 ft. in the Alps, 11,000 in the Pyrennes, and 15,000 in the Himalayas, constitute one of the most important Tertiary series in Africa, Europe, and Asia. The Pyramids of Egypt were faced with nummulitic limestone.

**NUN**, the name commonly given to a woman who retires from the normal activities of life and devotes her time to religious contemplation under certain vows. The term is properly reserved for those who live in an enclosed convent under vows regulated by pontifical law, and who never leave the precincts of the convent nor receive visitors there. Some mitigation of this rule has been given in recent centuries to all such orders, and with the establishment of Lay Sisters, Daughters of Charity and other groups, the word has had a wider connotation. Some take temporary and others perpetual vows, and various church regulations regarding "freedom of choice" and dowry guard entrance to the convent life. The best-known groups are the POOR CLARES, URSULINES, VISITANDINES, REDEMPTORISTS and those affiliated with the great monastic orders.

**NUNCIO** (Latin *Nuntius apostolicus*), a papal envoy whose office and residence are designated by the term nunciature. In earlier times nuncios were the so-called *legati missi* (see LEGATE), sent by prelates to exercise the papal prerogatives in specific districts. There were also nuntiatures responsible for carrying into effect the provisions of the Council of Trent and for retarding the spread of Protestantism, as in 1582 in Cologne. Such nuntiatures have frequently aroused opposition on the part of the episcopate because of conflicts in jurisdiction. At present the title is given to diplomatic representatives of the pope at royal and secular courts, who are always envoys of the highest rank. A nuncio accredited to a Catholic country is always the dean of the diplomatic corps.

**NUNEATON**, a municipal borough and railway junction of Warwickshire, England, situated in low land encircled by rising ground, on the Anker River and Coventry Canal, 97 mi. northwest of London. A 12th century priory of nuns was the origin of the prefix in the town's name. Nuneaton, largely modern and industrial, still has the handsome old Church of St. Nicholas which displays a medley of architectural styles, and there is an English Free School established in the 18th century. Industries

include the manufacture of textiles, tanning and metal working. Pop. 1921, 41,980; 1931, 46,305.

**NÚÑEZ, RAFAEL** (1825-94), Colombian statesman, was born in Cartagena, Colombia, in 1825. He was a publicist and started out as a socialistic radical and ardent federalist. In 1854 he was Minister of War, in 1862 a deputy to the Congress, and from 1880 to 1882 he served as Liberal president. At the conclusion of his term he visited Europe and became convinced that his early beliefs were mistaken. His experience as a statesman led him to conceive a dislike for "the multitude of partial sovereignties" a federal régime seemed to entail. Re-elected in 1884, he organized the Nationalist party and in the next year called a national council of states to reform the constitution. Here the reversal of his opinions was fully revealed. Before this council he proposed a highly centralized and nationalistic form of government and an educational system whose primary aim should be to inculcate Christian teachings in the youth of the nation. The constitution of 1886 embodied his ideas and the name of the nation was changed from the United States of Colombia to the Republic of Colombia. Until 1894 Núñez governed directly, or through vice-presidents. In 1888 he signed a concordat with the papacy restoring all the privileges it had lost during the Liberal régimes. He died in 1894.

**NUNN, T. PERCY** (1870- ), English educator, was born in 1870 and educated at University College, Bristol. He taught in various secondary schools until 1905, when he became vice-principal of London Day Training College, University of London. He was made principal in 1922, and served at the university as professor of education after 1913. In 1925 he was visiting professor at Columbia University. He was elected a senator at the University of London in 1929. His publications include *Aims of the Scientific Method*, *Relativity and Gravity*, and *Education Reform*, and many articles in educational publications.

**NUREMBERG** or **NÜRNBERG**, the largest commercial city in Bavaria, situated between the Regnitz River and the Ludwigs canal, about 6 mi. southeast of Fürth. It owes its importance not only to its location between south and northeast Germany, but also to its early development as a free imperial city. The old part is still surrounded by moat, walls and towers. The houses are mostly old and quaint. Most notable of the buildings are the churches: St. Lawrence, a fine example of Gothic architecture, built in 1274-1477; St. Sebastian, also Gothic, begun in the 13th century; the Church of Our Lady and the Church of the Holy Ghost, both of the 14th century; and St. James's, of the 12th century. All these churches contain priceless works of art. Among the other buildings, the imperial castle, the "Burg," is foremost, which was begun by Henry II, and completed under Frederick I Barbarossa. The 17th century rathaus has fine fountains and mural paintings by ALBRECHT DÜRER and his pupils. Dürer's home, maintained as a museum, is an interesting private

house, as is also that of HANS SACHS. The city has a large number of fine fountains and statues. The chief products are metal goods and machines, chemicals, toys, carvings, lead pencils and cakes. Nuremberg is the world market for hops, and it trades also in grain, flour and groceries. Pop. 1925, 392,494.

**NURMI, PAAVO** (1898- ), Finnish runner, was born at Abo, Finland, in 1898. He ran his first race at Helsingfors in 1914. At the 1924 Olympiad at Paris he established two world's records, covering 5,000 meters in 14 min. 28.2 sec., and 10,000 meters in 30 min., 6.2 sec. In 1928 he covered 15 kilometers in 46 min., 46.6 sec. and the same year ran 10 mi. in 50 min., 15 sec. In addition to other records up to 10 mi., the Finnish runner has held the world's record for the mile covered in 4 min., 10.4 sec. at Stockholm in 1923. In June 1930 he established his 12th world record, covering 6 mi. in 29 min., 36.6 sec., at Stamford Bridge, England.

**NURSERY SCHOOL**, a comparatively recent development in education of the preschool child. While they are strongly advocated in America and are found in two-thirds of the states, they are favored in Great Britain mainly for children whose home environment is detrimental to their health and training. The usual age of children attending these schools is two to five. The nursery school is not as yet a part of the public school system. In 1931-32 there were 203 such schools located in 121 cities in the United States and in 36 states and the Territory of Hawaii.

**NURSING.** Though nursing must of necessity have been practiced from remote times, its existence as a vocation is comparatively recent. In the United States the first attempt to teach nurses began in New York Hospital in 1798, when Dr. Valentine Seaman inaugurated a course of twenty-four lectures.

It remained for Florence Nightingale, "the Lady of the Lamp," to light the way to modern nursing. The British public, in recognition of her valuable services in the Crimean War, raised money for the establishment of a training school under her direction. This was opened at St. Thomas Hospital, London, in 1860.

The first training school of modern type in the United States was established in 1872 by the New England Hospital for Women and Children, followed in the next year by Bellevue Hospital of New York City.

North Carolina, in 1903, passed laws governing registration of nurses in its state, thereby regulating the educational standards of its training schools and formulating a definition of the term "Registered Nurse." Other states followed this action and in 1923 all of them had legislation to this effect.

The course of training is from two to three years, of which two or three months are passed in a period of probation. During this time the pupil's physical strength, education, powers of observation, adaptability and endurance are tested. She receives board, lodging, and laundry, but no pay until the satisfactory completion of the probationary period, when she signs

an optional agreement for the remainder of the term and receives an allowance of ten to twelve dollars monthly. Now her duties are directed in compliance with the National Curriculum approved by the Board of Directors of the American Nursing Association. Definite numbers of hours in theory on stated medical and nursing subjects and in practical work in the wards and departments of an accredited hospital are required.

Hospitals are accredited by passing periodic inspections by a state appointed committee. The degree of Registered Nurse (R.N.) is granted to persons who graduate from such an institution and pass the State Board Examination for Nurses. The practice of nursing is limited to that state in which the registration was made, unless reciprocity is established between two states.

The degree of R.N. never authorizes a nurse to undertake the treatment of diseases. Her foremost duties lie in recognition of an emergency and knowledge of proper action, adherence to hygienic standards in the routine care of patients, the faithful and intelligent observation and notation of the changing symptoms, and the prompt and accurate execution of the physician's orders.

A variety of types of service are open to the graduate nurse, among which are: private duty nursing, which is the special care of an individual patient in a hospital or residence for remuneration made by the patient; hospital supervision, which is executive ward or departmental work under salary from the hospital; visiting nursing, a service employed by the city or state for the nursing care of the sick in their homes and for the instruction of well members of the homes in the intelligent care of the patient during the nurse's absence; school nursing, maintained by educational boards for the care of children in public schools; and industrial nursing, supported by commercial enterprises to reduce accidents and minimize illness among employees.

Advanced courses to fit nurses for teaching and administration are now being offered by institutions of higher learning, notably Columbia University and Yale University. E. Wl.

**NURSING EDUCATION.** The foundation of nursing education is to be found in the MIDDLE AGES in the organization of orders of deaconesses and the famous religious nursing orders, both male and female. After a period of stagnation which began in the 17th century, a movement for the training of nurses began at the close of the 18th and beginning of the 19th century, which resulted in the founding of the first modern school for nurses at Kaiserwerth on the Rhine. This school inspired the establishment of other schools in Germany, and through Elizabeth Fry led to the establishment of an Institute of Nursing connected with Guy's Hospital in London. Following an inspection of European hospitals Florence Nightingale organized in 1860 a system of nursing education at St. Thomas's Hospital, London, which in time influenced the creation of similar systems in England and in the

United States from 1872 on, as Bellevue Hospital, New York; Connecticut Training School, New Haven; and the Massachusetts General Hospital, Boston. Although considerable progress has been made in advancing standards of preparation and training, to which contributions were made by individuals like Isabel Hampton Robb and M. Adelaide Nutting, organizations like the American Nurses Association and the National League on Nursing Education, and training schools affiliated with universities, as University of Minnesota, Northwestern University, Johns Hopkins University, and Teachers College, Columbia University, the movement toward effective standardization is confronted by serious obstacles: the existence of practical nurses side by side with registered nurses, small independent hospitals, and inadequate state regulations for registration. The recognition of the social importance of nursing through the realization of the place of the nurse in public health programs, preventive work, and work with young children, schools and industrial concerns will contribute to the advancement desired by leaders in the profession. I. L. K.

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**NUT.** Strictly speaking, the term is applied to a kind of fruit consisting of one or more kernels surrounded by a hard shell. Loosely, the term is used to cover other fruits which do not have the hard pericarp and there are even certain leguminous pods and tuberous roots which are called nuts.

Many nuts are important sources of oil and others are used for food in their natural state. From a food standpoint, nuts are highly concentrated, containing large amounts of protein and fat. For this reason, they should be eaten sparingly and if they form a regular part of the diet, leafy vegetables should be added to provide bulk and roughage. Some nuts are used as beads for personal adornment and from others, buttons and similar ornaments are turned. Of the greatest commercial importance are the following:

Name	Locality	Uses
Almond ( <i>Amygdalus communis dulcis</i> )	S. Europe and California	Food-oil
Brazil nut ( <i>Bertholletia excelsa</i> )	S. America	Food-oil
Breadnut ( <i>Brosimum Ali-castrum</i> )	West Indies	Food
Candlenut ( <i>Aleurites triloba</i> )	South Sea Islands	Oil
Cashew nut ( <i>Anacardium occidentale</i> )	W. Indies, Trop. Am.	Food-oil
Chestnut ( <i>Castanea</i> sp.)	So. Eu., No. U.S., E. Asia	Food
Coconut ( <i>Cocos nucifera</i> )	Tropics	Food-oil
Cola nut ( <i>Cola acuminata</i> )	West Africa	Food
Filbert or Hazelnut ( <i>Corylus Avellana</i> )	Europe, No. America	Food
Ginkgo ( <i>Ginkgo biloba</i> )	China and Japan	Food-oil
Hickory ( <i>Carya alba</i> )	N. America	Food
Nutmeg ( <i>Myristica fragrans</i> )	Tropics	Spice
Olive ( <i>Olea europaea</i> )	S. Europe, California	Food-oil

Name	Locality	Uses
Palm nut ( <i>Elais guineensis</i> )	W. Africa	Oil
Peanut or ground nut ( <i>Arachis hypogaea</i> )	Tropics, Subtropics, So. U.S.	Food-oil
Pecan ( <i>Carya olivæformis</i> )	No. America	Food
Physic nut ( <i>Jatropha curcas</i> )	Tropical America	Medicine
Pinon ( <i>Pinus</i> sp.)	So. U.S. and Mexico	Food
Pistachio ( <i>Pistachia vera</i> )	So. Europe	Food
Soap nut ( <i>Sapindus Saponaria</i> )	West Indies	Washing
Souari nut ( <i>Caryocar nuciferum</i> )	Guiana	Food
Walnut ( <i>Juglans regia</i> )	Asia, Europe, California	Food
Water Chestnut ( <i>Trapa</i> sp.)	So. Europe, China, India	Food

Many other nuts are interesting while not of great commercial importance. The coquilla nut, the hard inner stone of the pissaba palm of Brazil, is called vegetable ivory. It takes a beautiful polish and millions of buttons are turned of this intensely hard substance, light brown in color and streaked with white. Another "vegetable ivory" is the corozo nut (*Phytelphas macrocarpa*), also found in tropical South America.

The important medicinal drug strychnine comes from the poison nut (*Strychnos Nux-vomica*) of the East Indies. The marking nut (*Semecarpus Anacardium*) is closely allied to the cashew, and derives its name from the fact that when mixed with lime the acid juice of the unripe shell is used locally as a marking ink. Betel nut (*Areca Cathecu*) is one of the chief ingredients of *pan*, widely used for chewing by the natives of India and other Asiatic countries. Nut galls (*Quercus infectoria*) occur on oak trees. These swellings, which are caused by an insect, contain a large amount of tannin and are used in tanning certain leathers and in making ink and dyes.

**NUTATION**, or nodding, the term applied to the small periodic motions of the pole of the earth. The principal one is caused by the varying attraction of the moon, as the line of apsides of its orbit turns around in 19 years.

**NUT BROWN MAID, THE**, the heroine of a 15th century English ballad, first appearing in Arnold's *Chronicle*, 1502. The story of her love for the "banished man," who is in reality an earl's son, was paraphrased by MATTHEW PRIOR in *Henry and Emma*, 1718.

**NUTCRACKER**, a genus (*Nucifraga*) of birds closely allied to the crows, but differing in their smaller size, nearly cylindrical bill and usually spotted gray or brown and white plumage. There are four species, all native to coniferous forests, three occurring in the arctic regions of the Old World and one in the mountainous regions of western North America. The American nutcracker (*N. columbiana*) or Clarke's crow, is about a foot long with gray body plumage, black wings marked with a white patch, and a black and white tail. Shy and gregarious, it moves in noisy companies and utters loud discordant notes. Although practically omnivorous it feeds largely on seeds of coniferous trees, especially those of the pine, which it holds in its claws and cracks with its bill. It breeds early, often while the snow is still on the

ground, building deeply cup-shaped nests in a tree and laying 3 or 4 grayish, finely spotted eggs.

**NUTHATCH**, the common name for a family (*Sittidae*) of small passerine birds resembling both the titmice and the creepers. There are about 60 species and subspecies, found usually in woodlands, nearly throughout the world except in the American tropics and in Africa. They are of stocky build, ranging in length from about 5 to 7 in. and bluish or grayish above and whitish, buffy or rusty below, with long, pointed wings and short tails. Extremely active in habit, nuthatches climb about rapidly on the trunks of trees or faces of cliffs in search of insect food. Unlike woodpeckers they often climb head down and never use their tails as props. They also feed somewhat on nuts, as the beech-nut, which they open by repeated blows of the bill. Most nuthatches have harsh voices and nest in holes, laying usually 5 to 8 speckled, whitish eggs. The North American species include the well-known white-breasted nuthatch (*Sitta carolinensis*) of the eastern United States and Canada, the red-breasted nuthatch (*S. canadensis*), found widely in North America, the brown-headed nuthatch (*S. pusilla*) of the southern Atlantic and Gulf states, and the pygmy nuthatch (*S. pygmaea*) of the western United States.



NUTHATCH  
Red-breasted, above. White-breasted, below

**NUTLEY**, a town of Essex Co., N.J., located on the Passaic River, 11 mi. west of New York City, 6 mi. north of Newark and contiguous with Belleville and Bloomfield. It is served by the Erie Railroad, electric trolleys and motor bus lines. While mainly a residential suburb it has a number of industries including the manufacture of textiles and paper. The retail trade in 1929 amounted to \$4,848,158. Nutley, originally the township of Franklin, was granted its charter as a town in 1902. It adopted the commission form of government in 1912. Pop. 1920, 9,421; 1930, 20,572.

**NUTMEG** (*Myristica fragrans*), a valuable, spice-bearing, evergreen tree of the nutmeg family. It is a native of the Molucca Islands and widely cultivated in various tropical countries, including the West Indies and Brazil. The tree grows about 25 ft. high bearing glossy, oblong, aromatic leaves, small flowers in axillary clusters and a yellow peach-like fruit. When ripe the fruit bursts into two pieces exposing the fleshy scarlet aril, which, when dried, forms the mace of commerce. The aril encloses a large seed with a hard outer shell removable, when dry, from the inner portion which is the nutmeg of commerce. Under pressure nutmegs yield a yellowish fat from which is extracted the oil of nutmeg.

**NUTRITION**, the science which includes all the processes by which food becomes a part of the body, building and repairing its tissues, supplying energy for its activities and insuring the normal functioning of all its parts.

From beginning to end of life there is a constant exchange of material in each active cell in the body, a breakdown and removal of worn out cellular constituents, death and disintegration of some cells, and replacement of lost elements with new material. This is what is meant by the repair or maintenance function of food.

In addition to maintenance, there is, during prenatal life, infancy and childhood, growth of new bone, muscle, skin, hair, etc., which requires suitable amounts of all the elements from which each kind of tissue is made. The foodstuffs which build and repair tissue are the proteins, minerals and water.

Every sign of life involves an expenditure of energy which cannot cease as long as life lasts. Even during sleep, the work of the heart, lungs, digestive tract, kidneys and other organs continues, and there is always some tension in the muscles regardless of the completeness of relaxation. The amount of energy used in the voluntary movement of the muscles of the limbs and other parts of the body is subject to wide variation. Severe exercise may make the energy expenditure of a man four, five or even six times as great as it would be were he sitting quietly in a chair. The fuel to supply the needed energy is derived from food, or, if this is insufficient, from the tissues themselves, in which case the body loses weight. If there is an overabundance of fuel, it is not burned but is stored, chiefly as fat, under the skin and around the muscles and various organs, increasing body weight. The fuel substances in food are the proteins, fats and carbohydrates. These are burned in the muscles, releasing their stored energy in the form of muscular work and heat.

A food supply which provides the needed materials for body building and repair and for fuel will result in a state of health and good nutrition for only a limited time, unless it also furnishes certain substances which enable the body cells to absorb this food, eliminate metabolic waste products, reproduce themselves, carry on the oxidations and reductions which liberate the energy stored in food; in other words, to go through their normal life cycle. It is by causing these reactions to occur and to progress in coordinated ways that food is said to regulate body processes. The regulatory foodstuffs are the minerals (*see* MINERAL ELEMENTS IN FOOD), the vitamins (*see* VITAMINS IN FOOD) and water.

Without enough of the essential vitamins, growth will cease or go on at a retarded rate, in spite of an abundance of building materials and fuel, the body will lose its vigor and become susceptible to various sorts of infections, reproduction and lactation will be interfered with, bones and teeth will not calcify properly, and other signs of poor nutrition will appear.

If there are not enough minerals, or if they are not

present in proper proportions, the normal neutrality of the blood will be disturbed, the ability of the muscles to respond to nerve stimuli will be diminished, food will not pass readily from the digestive tract into the blood and from the blood to the cells, and in other ways disturbances of normal processes will occur.

Only a very small part of the food eaten is in a form ready to pass through the membrane lining the intestinal wall into the blood to be transported over the body. Most foods must be dissolved and changed into simpler forms before they can be absorbed from the digestive tract. In other words, proteins, fats, starches and most sugars must first be digested before they can become available to the body. The process of digestion is partly mechanical and partly chemical, and requires for its performance muscular movements of the different parts of the alimentary tract and various digestive fluids containing enzymes, minerals and water.

Nutrition, therefore, depends upon a diet which will supply suitable materials in digestible form and in sufficient quantities to build and repair the tissues, to yield energy for body activities, and to regulate body processes. *See also* Food.

H. T. B.

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**NUT TREES**, in a wide sense, include all large woody plants the seeds of which are incased in a hard bony shell. As more commonly understood the term is applied to trees yielding nuts valued for food or other important uses. The most valuable nut-bearers are broad-leaved trees, though a few conifers, as the nut pines and araucarias, produce edible seeds.

The leading nut trees of temperate regions include the walnut, almond, chestnut, pistachio and filbert, all of which are cultivated. In the tropics there are many valuable nut trees among which are the coconut, palm nut, cola nut, cashew nut, brazil nut, ben nut, pekea nut, souari nut and sapucaya nut. Several of these are extensively cultivated.

In the United States, the most important native nut trees are the black walnut, butternut, American chestnut, various hickories including the pecan, and the piñons of the southwestern states. For further details see the article on the trees mentioned. X.

**Nut Culture.** Only two nut-bearing trees, the English walnut and the almond are extensively cultivated in the United States, although improved varieties of the pecan are attracting commercial attention in the southern states and several varieties of the American black walnut are being tried in the North. For some years experimentors have worked with hickory nuts, butternuts, beechnuts and chinquapins, but few improved varieties have been grown on an orchard scale. The supplies of these nuts appearing in the markets are from uncultivated trees.

Cultivated varieties of almonds, walnuts and pecans are all grafted or budded on seedling stocks, usually of the same botanical species. Almonds are grown

in nurseries one year from the bud before being planted in orchards; walnuts and pecans may be two or more years old when set. Almond trees being small are planted about 20 ft. apart in light, well-drained soil and managed like peach trees. Walnuts and pecans do better on heavier land and, being larger trees, demand more space, pecans as much as 60 ft. between trees. Almonds begin to bear when 3 or 4 years old and when well managed continue for about 20 years. Walnuts rarely begin before 5 years or pecans before 10, but the trees are long lived and bear with increasing abundance. Many California walnut trees are 50 years old and many wild pecan trees are estimated at 100 years or more. M. G. K.

**NUT-WEEVIL**, the popular name for the adults and larvæ of various snout beetles of the subfamily *Curculioninae*. The adults eat foliage but are rarely abundant enough to defoliate the trees on which they feed. The larvæ, however, are highly destructive of chestnuts, hickory nuts, acorns and various other nuts. The female beetles puncture the nut with their beaks while still small and lay eggs inside it. As the larvæ grow they eat out the kernels. When mature they drop to the ground to pupate. Infested nuts fall prematurely.

**NUX VOMICA** (*Strychnos Nux-vomica*), a tree of the logania family bearing highly poisonous seeds, the source of STRYCHNINE and brucine. It is a moderate-sized tree, sometimes 40 ft. high, native to India and Ceylon, with oblong leaves, numerous flowers in terminal clusters and a large, orange-like fruit containing numerous flattened seeds.

**NYACK**, a village in Rockland Co., southeastern New York, a residential suburb of New York City, situated on the west bank of the Hudson River, 25 mi. north of Manhattan. Buses, the Erie Railroad and ferries to Tarrytown serve the village, which includes also Upper Nyack and South Nyack. Nyack has yacht building plants, machine shops and factories producing shoes, pocketbooks and infants' wear. The first settlers came here about 1700. The village was incorporated in 1833 and named for an Algonquin tribe. Pop. 1920, 4,444; 1930, 5,392; combined pop. 1920, 6,781; 1930, 8,446.

**NYASA**, a lake of central Africa, about 260 mi. southeast of Tanganyika and 400 mi. from the Indian Ocean. It is 350 mi. long and has a total area of 11,000 sq. mi. Nyasa is a deep basin varying in width from 15 to 50 mi. and is everywhere navigable, although there are few good harbors owing to the proximity of lofty mountains and tablelands rising on each side of the lake. Its water level seems subject to fluctuation; in recent years it has been low, rendering the Shire river almost unnavigable.

**NYASALAND**, a British protectorate of south Africa, lying along the western and southern shores of Lake Nyasa and bounded on the south and east by Portuguese East Africa, on the west by Northern Rhodesia and on the north by Tanganyika. It comprises an area of over 37,890 sq. mi. The country is a high plateau broken up by occasional lowlands.

Most of the highlands lie at elevations from 6,000 to 8,000 ft. A considerable part of the territory is covered with forest but the trees are small and of little commercial value. Tobacco is the principal crop of Nyasaland. In 1928 nearly 12,000,000 lbs. were exported. Other important products are cotton, tea, coffee, sisal hemp and maize. The main imports are foodstuffs, agricultural machinery, textiles, vehicles and various other manufactured articles.

The capital of the protectorate is Zomba. Other chief settlements are Blantyre, Limbe, Kota-Kota, Likoma, Port Herald and Bandawe. The territory is administered by a governor and commander-in-chief, who is assisted by executive and legislative councils. Throughout Nyasaland there are 14 Christian missions which are engaged in educational as well as medical and religious work among the natives. Pop. 1929, 1,360,000. There were about 1,877 Europeans and 1,085 Asiatics.

**NYE, EDGAR WILSON** (1850-96), American humorist, better known as "Bill Nye," was born in Shirley, Me., Aug. 25, 1850. At 26 he was admitted to the bar at Laramie, Wyo. He soon gained a reputation as a humorist by his articles contributed to western newspapers, and in 1881 he started his own paper, *The Boomerang*, at Laramie. He later gained considerable fame as a humorous lecturer as well. His humor was robust, unsubtle, and Nye was particularly fond of punning. Typical of his writings are *Bill Nye and the Boomerang*, 1881, *Forty Liars and Other Lies*, 1883, and his comic histories of the United States and England. He died at Arden, N.C., Feb. 22, 1896.

**NYIREGYHAZA**, capital of the Hungarian county of Szabolcs-Ung, and a railroad center. The city engages chiefly in the cultivation of tobacco and grain, raises cattle, manufactures soap, candles, barrels, machines, sunflower oil, cement, candy and chocolate. It has an iron foundry and distillery. Since 1914 it is the seat of a Greek Catholic bishop. Nearby is the watering place and summer resort, Sostofurdo. Mentioned in the 14th century, Nyiregyhaza was depopulated by the civil war in the 17th century, and resettled by Slovaks. Now the great majority of the inhabitants are Hungarian. Pop. 1930, 51,273.

**NYMEGEN**, a city and former fortress in the Dutch province of Gelderland, located on seven hills with three bridges over the Waal. The city has 24 squares and market places, the Gothic St. Stephen's Church, 13th-15th centuries, seven other churches and a splendid city hall of 1554 with pictures of emperors and kings of the German Empire. The fortifications were transformed into a ring street, 1877-84. The chief products are tobacco and cigars, brick, cologne, pottery and metal goods, glue and leather. It has two harbors and trades in grain and transit goods. Near the city are the ruins of a castle of Charles the Great, which later became residence of the Frankish kings and of the Burggraves of Nymegen. The chapel is still intact. The Roman Noviomagus, it was a free imperial city in the 10th-13th centuries,

but fell into Spanish hands in 1585. In 1591 it was captured by Prince Maurice of Orange. Occupied by the French in 1672-74, a peace conference was held in 1678 and 1679 between France and the Netherlands, France and Spain, and Austria and France. The Treaty of Nymegen returned to the Netherlands all its captured possessions. Pop. 1930, 81,686.

**NYMPH**, an entomological term applied to those immature insects which have no inactive or pupa stage between egg and adult. The newly hatched insect more or less closely resembles the adult but lacks wings. As it develops and sheds its skins many times "wing pads" appear but do not function. Wings become functional only when the nymph becomes an adult. Grasshoppers and true bugs are examples of insects having a nymphal stage. Such insects are said to have gradual metamorphosis.

**NYMPHS**, in Greek mythology, were semidivine goddesses. They were very numerous. Oceanids were daughters of OCEANUS, whose home was the outer sea. NEREIDS were daughters of NEREUS and dwelt in the Mediterranean or inner sea. DRYADES were nymphs of the trees. There were also nymphs of groves, mountains, rivers, valleys, grottos and even of countries. Nymphs had their special sanctuaries where were made sacrifices usually consisting of goats, lambs, milk and oil, but never of wine.

**NYSTAD, TREATY OF**, the agreement signed in 1721 ending the Northern War between Sweden and Russia. The treaty was drawn up at Nystad, Finland. Under its terms Russia obtained Ingermanland, Estonia and Livonia, and parts of Finland and Karelia, restored northern and western Finland and paid \$2,000,006 to Sweden. *See* RUSSIA, HISTORY OF; SWEDEN, HISTORY OF.



**OAK**, the collective name of a large group of trees and shrubs belonging to the genera *Quercus* and *Lithocarpus*, of the family *Fagaceæ*; also applied popularly to various other plants resembling true oaks in foliage, wood, or other features. The characteristic feature of oaks is their well-known fruit, the acorn. The flowers of all oaks are individually minute and the staminate are borne in slender catkins. *Lithocarpus* has erect catkins with flowers in groups and minute terminal stigmas, while *Quercus* has drooping catkins, separate flowers and well-developed stigmas. *Quercus* is divided into six subgenera, based on the structure of the flowers and fruit. Three of these are exclusively of the Old World; a fourth contains five species only, all in western North America. The fifth, or Red Oaks, is North American and includes 189 species, in most of them the acorn requires two years to mature and the leaves are often sharply awned at the tip or marginally at the end of the veins. The last, or White Oaks, includes the few species of northern Europe and 177 species in America: the acorns mature in one year and the leaves are not awned. *Lithocarpus* is a smaller genus, with about 100 species in southeastern Asia and the Malay Archipelago and a single species, the tan-bark oak (*L. densiflora*) in California.

*Quercus* belongs essentially to the north temperate zone and is there found in all forested regions except the northern evergreen forests. The greatest number of species of *Quercus* grows in western and north-western Mexico, where 253 are reported. Here the cooler climate of the mountains compensates for the tropical or subtropical latitudes. A few species follow the mountains to Colombia; one occurs in Cuba. The eastern and southeastern United States have 40 species, of which the white (*Q. alba*), chestnut (*Q. Prinus*) and the evergreen live (*Q. virginiana*) oaks of the white oak group, and the red (*Q. rubra*), scarlet (*Q. coccinea*), and black (*Q. velutina*) oaks of the red oak group are noteworthy. The Rocky Mountain region contains 19 species, all of the white oak group, while 14 are found in California. Among the latter, the valley oak (*Q. lobata*) is the largest, exceeding 100 ft. in height and 150 ft. in total spread of the lower branches. Most other western species are small trees or shrubs. Oaks are abundant in eastern and southeastern Asia and the Mediterranean region; north of the Alps the species are few but constitute an important element of the forests. Geologically oaks are of great antiquity and abundant fossil remains indicate the existence of numerous species during the Cretaceous and Tertiary periods.

Oaks are slow-growing trees, with hard heavy wood of great strength and durability. For centuries the wood of *Q. Robur* has been used for building in Europe and the preservation of many ancient build-

ings has been due to its qualities. Many American oaks are equally useful, but the high price of oak lumber has generally restricted its use to interior decoration and furniture, to both of which it is excellently adapted; the wood of the white oak is especially prized. The forests of the lower Mississippi Valley are at present the chief source of oak lumber. Cork is manufactured from the thick bark of the cork oak (*Q. Suber*), a native of the western Mediterranean region. The acorns of a few species are edible. Many kinds of oak are rich in tannic acid and their bark is used in the leather industry. Oak-galls, produced on various species by gall insects, also contain tannic acid, and those of *Q. lusitanica*, of the eastern Mediterranean region and adjacent Asia, are valuable in tanning, dyeing, and the manufacture of ink. Oaks are often used as park and street trees, more frequently in Europe than in America, where more rapidly growing trees are preferred. Pin oak (*Q. palustris*) is perhaps the most popular kind in the eastern states, while the huge trees of live oak, their branches festooned with Spanish moss, are famous in the South.

In 1930 the total cut of oak lumber in the United States amounted to 1,661,691,000 bd. ft., valued at the mill at \$48,669,939. Four-fifths of this oak lumber was cut in the Southern States, among which Tennessee, Louisiana and Arkansas were leading producers.

H. A. G.

**OAK HILL**, the former residence of President JAMES MONROE, in Loudon Co., Virginia. The house, built by Monroe during his administration, is made of white-painted brick, has tall chimneys and a fine portico, and is so situated on a hill that it is visible from the countryside for miles around.

**OAKLAND**, third largest city of California, the county seat of Alameda Co., is situated on the eastern shore of San Francisco Bay facing the Golden Gate, about 3 mi. east of San Francisco. It is the western terminus of the Southern Pacific, Western Pacific and Santa Fé transcontinental railroad systems. Additional transportation is afforded by a municipal airport, bay ferries, highway bus lines and ocean-going steamers. The industrial section lies crescent-shaped along the bay, while the residential section is behind this, on gently sloping hills commanding fine views of the water and the Golden Gate and San Francisco directly opposite. Surrounded by a rich agricultural and fruit-growing region, Oakland is an important shipping center. In 1929 its manufactures, which had a total value of approximately \$218,000,000, included steel, lumber, explosives, automobiles and twine. Four shipbuilding plants are located here. Canning and preserving is the most important industry. Oakland is the retail shopping center for Berkeley, Alameda



and the smaller urban units of the East Bay district. In 1929 its 5,102 retail stores, which did a total business of \$204,436,860, gave full-time employment to 16,392 men and women. Oakland is the seat of St. Mary's College for Men, founded in 1863, and Mills College for Women, opened in 1871, while the University of California, in Berkeley, is only 4 mi. distant. The city's public school system and its park and recreational facilities are unusually well developed. Lake Merritt, the only tidal lake in the heart of any American city, is one of the chief scenic attractions. Oakland has been the home of Edwin Markham, Jack London and Joaquin Miller. Oakland was incorporated as a town in 1852 and chartered as a city in 1854. Pop. 1920, 216,261; 1930, 284,063.

**OAKMONT**, a residential suburb of Pittsburgh and a borough of Allegheny Co., situated on the Allegheny River, southwestern Pennsylvania. The Pennsylvania railroad and bus and trolley lines afford transportation. Pop. 1920, 4,512; 1930, 6,027.

**OAK PARK**, a village, claiming to be the largest in the world, of northwestern Illinois, in Cook Co., 9 mi. west of Chicago. It is chiefly a residential community. In 1929 the value of the local manufactures was about \$3,000,000; the retail trade amounted to \$31,592,410. The first permanent settlement was made in 1835; originally part of the township of Cicero, Oak Park seceded under separate incorporation in 1902. Pop. 1920, 39,858; 1930, 63,982.

**OASIS**, a watering-place in the desert. Where springs, artesian wells, or small watercourses from the mountains make irrigation possible, deserts like the Sahara support date-palms, sparse grasses, and even meager crops, especially of alfalfa. Oases are excessively hot places, menaced by sandstorms. Their relative fertility, however, determines the position of permanent settlements and of the great caravan routes across the waste. On larger oases, watered by streams, cities appear, like Biskra, in Algeria, or Merv and Bokhara, southeast of the Caspian Sea.

**OAT**, an annual plant (*Avena sativa*) of the grass family, the only species of agricultural importance of its genus. Its grain is used for human and animal food, its straw for bedding. Though the original home of the oat is unknown it is supposed to be a native of Eastern Europe.

Almost all the great oat-growing areas of the world are in the northern part of the north temperate zone—Canada, the United States, Scandinavia, Great Britain, Germany and Russia. More recently Australasia, South Africa and South America have become oat-producing regions but not to an extent comparable with the northern areas.

In America oats have been grown since the days of the earliest settlers, being sown on the Elizabeth Islands, Mass., in 1602, since when their culture has reached every province in Canada and every state in the Union, though grown to a small extent in the South as compared with the North Central States.

Oat varieties are of three classes: spreading, banner, or sided, and hullless. In the first, which is the

largest, most popular class, the panicles branch in all directions; in the second they hang on only one side, hence the names; in the third (which includes varieties in both the above classes) the hull is so loose the grain separates from it completely when threshed. As hullless varieties yield less bountifully than the others they are not largely grown. A second classification has been made based on more intimate characters of the heads, the straw and the length of hull needed to mature. From the market standpoint varieties are also classed as white, highest priced and grown mostly in the North; red and gray, popular for forage and pasture in the South; and black, grown in the North but less esteemed than white varieties.

Choice of variety depends largely upon climatic and soil conditions. Varieties with closed panicles are hardier and more prolific than open panicked kinds provided the season is long enough for them to mature; but the latter, being the quicker to mature, average better during a series of years.

Care in selection of seed is more important than variety; for any variety adapted to the locality can be made prolific by discarding all but plump, heavy grain, free from weed seed and resistant to disease. By such selection the yield has been increased 10 to 15% as an annual average during ten years. As a treatment for smut, formaldehyde, one pint in 36 gals. of water to each 40 bu. is an inexpensive preventive.

For their best development oats require cool weather and ample soil moisture. Therefore they are sown as early in spring as possible. If the soil is too rich the plants will be weak-stemmed and will "lodge" (fall over) with resultant loss. They will need no fertilizer if they follow well-manured corn in such rotations as clover and timothy two years, corn, oats and wheat one year each.

#### OAT PRODUCTION, U.S.

7-Year Average, 1924-30

Division	Acreage (1,000 Ac.)	Production (1,000 Bu.)	% of Tot. Prod.
UNITED STATES . . . . .	42,354	1,355,618	100.0
LEADING STATES:			
Iowa . . . . .	6,063	223,482	16.5
Minnesota . . . . .	4,411	160,250	12.0
Illinois . . . . .	4,478	146,176	10.8
Wisconsin . . . . .	2,518	103,163	7.6
Nebraska . . . . .	2,499	72,901	5.3
Ohio . . . . .	1,911	69,731	5.1
South Dakota . . . . .	2,413	69,654	5.1

Oats are harvested when the seeds have just passed from the "milk" to the hard "dough" stage or shortly after. In general best quality grain is obtained by covering the round shocks with cap sheaves. In the northern states yields of 50 to 75 bu. to the acre are considered usual; in the South 10 bu. yields are common.

M. G. K.

**OATES, TITUS** (1649-1705), English conspirator, was born in 1649 the son of an Anabaptist preacher. He pretended to be a Roman Catholic so as to lay bare various Catholic plots against the life of Charles II. His declared revelations were then, and are now,



PAINTED FOR THE NATIONAL ENCYCLOPEDIA BY MARY E. LAYON

NORTH AMERICAN OAKS

Scrub Oak (*Quercus ilicifolia*): 1. Acorn-bearing branch in autumn. 2. Leaf after frost. 3. Flowering branch in spring.

Chestnut Oak (*Quercus prinus*): 4. Acorn-bearing branch in autumn. 5. Flowering branch in spring.



regarded as complete perjuries and forgeries. In 1685 Oates, at the instance of James II, was convicted of perjury, but in 1689 he was pardoned and pensioned. He died July 12, 1705.

**OATH**, a formal promise, made before proper authorities, to tell the truth. Usually, in courts, the oath taker touches the Bible with his left hand, raises the right, and asserts that he will "tell the truth, the whole truth, and nothing but the truth." Jews are sworn on the Old Testament, with the head covered; a Mohammedan by touching the Koran; a Chinaman by breaking a Chinese saucer.

**OAXACA**, a state of Mexico, situated on the Pacific coast, and the most southern state of the republic. It has an area of 35,689 sq. mi., and a coast line of 255 mi. The Sierra Madre Mountains occupy almost the entire state, rising to great heights almost at the water's edge. Many of the peaks are more than 10,000 ft. high, and at their base are covered with pine forests of great value commercially. Some of these are Zempoatepetl, San Felipe and Cerro del León. The climate varies from extreme cold to extreme heat according to the altitude. The Rio Verde is the principal river of the state. The wide, fertile valley of Oaxaca, in the central part, produces almost every variety of tropical fruit known to Mexico, as well as coffee, cane, cacao and rice.

Many Indian relics are found in Oaxaca, among them the famous ruin of Mitla, some pyramids, old fortresses and many caves. The capital of the state is OAXACA, and other cities are Tehuantepec, Zachua, Tlacolula and Miahuatlan. Pop. 1921, 976,005; 1930, 1,070,852.

**OAXACA**, a city of Mexico, and capital of the state of the same name, situated about midway between Mexico City and Vera Cruz, at an elevation of 5,070 ft. above sea level. It is an important commercial center for southern Mexico and has a progressive administration. The houses are strongly built, some of them resembling fortresses, to resist the shock of earthquakes common to that part of Mexico. The city has street cars, electric lights, a good market and many old churches, among which the Church of Santo Domingo, begun in 1575 and completed a century later, is the most interesting. Near the city stands the great tree of Tule, 120 ft. in diameter, and 160 ft. high. About 25 mi. away are found the noted ruins of Mitla. Oaxaca was founded in 1486, and incorporated by the Spanish in 1529. It was the childhood home of both Benito Juarez and Porfirio Diaz. Pop. 1921, 27,792; 1930, 30,940.

**OB**, a river of Asiatic Russia, rising in the Altai Mountains and flowing a distance of 2,450 mi. through western Siberia to an inlet of the Arctic Sea. The Ob is navigable by river steamers for five months of the year from its mouth to Busk, but the Kara Sea into which it flows is ice-free for only two months. As the Ob rises in the south the break-up of the ice begins there, and the liberated water, supplemented by that from melting snow, reaches the middle course before the ice in this area has thawed; huge floods

ensue, the water spreading far and wide, unable to sink through the frozen ground. The watershed between the Ob and the Yenisei is so low that their flood waters unite, and for a time water runs into one river or the other according to the direction of the wind.

Trade with western Europe, by ships that ply once in the year through the Arctic Sea, is becoming important. For about six weeks in August and September ships of 1,500 tons can exchange manufactured goods for timber, butter, hides and furs, flour, linseed and hemp. In July a fleet of 1,000-ton barges, towed by steamers, leaves Novo-Kolievsk for the mouth of the Ob, where it is met by a fleet of British steamers. An interchange of cargoes is made, each fleet having its own workers, and the fleets return to their bases. Wireless is used to report the state of the Arctic ice and sea passages.

The chief tributaries of the Ob are the Irtish, Tcharysh, Tom and Tchulym, all navigable. The towns on the banks of the Ob are Barnaul, Tomsk and Narym.

**OBADIAH, BOOK OF**, is the shortest of all the prophetic writings of the Old Testament, and consists of but 21 verses. We know nothing of the prophet whose name it bears. Some scholars give it a pre-exilic, and others a post-exilic date, the latter feeling that its condemnation of Edom fits in with the times when that nation exulted over the fall of Jerusalem. Its original text is in pure Hebrew but so obscure in places that its full message is lost. The book tells of a messenger of Jehovah sent among the nations to stir up a rising against Edom, but "in mount Zion there shall be those that escape."

**OBEDIENT PLANT** (*Physostegia virginiana*), a perennial herb of the mint family grown in wild-gardens and as a border plant, called also dragon-head. It is native to moist low grounds from Quebec to Minnesota, southward to Florida and Texas. The very smooth, slender, wand-like stem, 1 to 4 ft. tall, bears lance-shaped, strongly toothed leaves and one or more terminal spikes of showy purplish-red or rose-pink flowers blossoming in midsummer. When moved in various directions on its short stalk, the flower exhibits the peculiarity of remaining temporarily in whatever position it is placed, whence the name.

**OBERAMMERGAU**, a village in Bavaria, Germany, on the Ammer River, about 45 mi. southwest of Munich. Oberammergau is famous as the scene of the Passion Play given every ten years in fulfillment of a vow made by the citizens in 1634. Practically everyone in the village takes part in the per-



P. A. RYDBERG, "FLORA OF PRAIRIES AND PLAINS"

OBEDIENT PLANT

formances, which are visited by thousands of tourists. Pop. 1925, 2,281.

**OBERHAUSEN**, a German city in the province of Rhine, situated about 6 mi. east of the Rhine River and about 20 mi. north of Düsseldorf. It verges on the cities of Mulheim, Duisburg, Hamborn, Sterkrade and Essen. It has important iron and steel plants and other industries, and trades in lumber, cattle and leather. Pop. 1925, 105,436.

**OBERLIN, JEAN FRÉDÉRIC** (1740-1826), Alsatian clergyman and philanthropist, was born at Strasbourg, Aug. 31, 1740. He was educated at the University at Strasbourg, and after 1766 became a Lutheran clergyman in Ban-de-la-Roche, a valley in Alsace. Here he did much to help the inhabitants, opening a bank, improving the methods of agriculture, and founding schools. Oberlin was a supporter of the French Revolution and gave shelter to many refugees. He died June 1, 1826. Oberlin, O. and Oberlin College were named for him.

**OBERLIN**, a village in Lorain Co., northeastern Ohio. It is situated 34 mi. southwest of Cleveland bus lines. It is the seat of OBERLIN COLLEGE, founded by John J. Shepherd and Philo P. Stewart in 1833. During the Civil War Oberlin served as one of the Underground Railroad stopping-places. It is the birthplace of the Anti-Saloon League. Pop. 1920, 4,236; 1930, 4,292.

**OBERLIN COLLEGE**, at Oberlin, O., a coeducational, privately controlled, and non-sectarian college, opened in 1833 as Oberlin Collegiate Institute. In 1850 the name was changed to Oberlin College. A preparatory school known as Oberlin Academy was in existence from 1833 to 1916. The theological department, instituted in 1835, became the Graduate School of Theology in 1916. Oberlin had productive funds in 1931 totaling \$18,179,915. Carnegie Library contains 332,866 volumes. In 1930-31 there were 1,754 students and a faculty of 197, headed by Pres. ERNEST H. WILKINS.

**OBERON**, an opera in three acts by C. M. von WEBER, libretto based on an old French tale by James Robinson Planché; première, London, 1826, New York, 1827. It succeeded *Der Freischütz* and *Eury-anthe*, Weber's most popular operas, and was produced only two months before the composer's death. The opera, now rarely produced, has a fairyland setting.

Oberon and Titania, king and queen of fairyland, have quarrelled; and the king has sworn not to be reconciled until he finds two lovers whose love is untroubled by dissension. Having ranged over the world in search of them, Puck returns with the news that he has found a likely subject for experiment. Sir Huon de Bordeaux, who has killed the son of Charlemagne, has been condemned to go to Bagdad, slay the caliph's councilor, Babekan, and claim Rezia, the caliph's daughter, in marriage. Oberon conjures up a vision of the lovely Rezia and transports Sir Huon magically to Bagdad. There the latter vanquishes Babekan, carrying off Rezia and Fatima. Their vessel is wrecked, and Rezia is captured by pirates, even-

tually being sold to the emir, Almansor. Despite every temptation she remains constant to the memory of Sir Huon. He is tempted by Almansor's wife, Roschana, but also remains true to Rezia. Both are condemned to death, only to be saved magically the next hour by a blast on the magic horn of Scherasmin, Huon's companion. Oberon thereupon appears with Titania, with whom he now is fully reconciled, and Charlemagne pardons Sir Huon who is united with Rezia.

**OBESITY**, a condition characterized by the excessive deposit of fat in the body. Heredity is a factor of importance in the occurrence of the disorder. Simple obesity is due to disproportion between food intake and the bodily activity, that is, too much food and too little exercise. Other cases are due to some difficulty with the glands of internal secretion. Lack of thyroid secretion, with lowering of the metabolism, results in obesity. Underactivity of the posterior lobe of the pituitary gland as well as the gonads plays an important part in some cases. So-called juvenile obesity is probably due also to deficiency in the secretion of the posterior part of the pituitary gland. (See PITUITARY GLAND.)

Treatment consists in reducing the food intake and increasing the exercise in simple obesity and in the use of such active glandular extracts as are available for the other types.

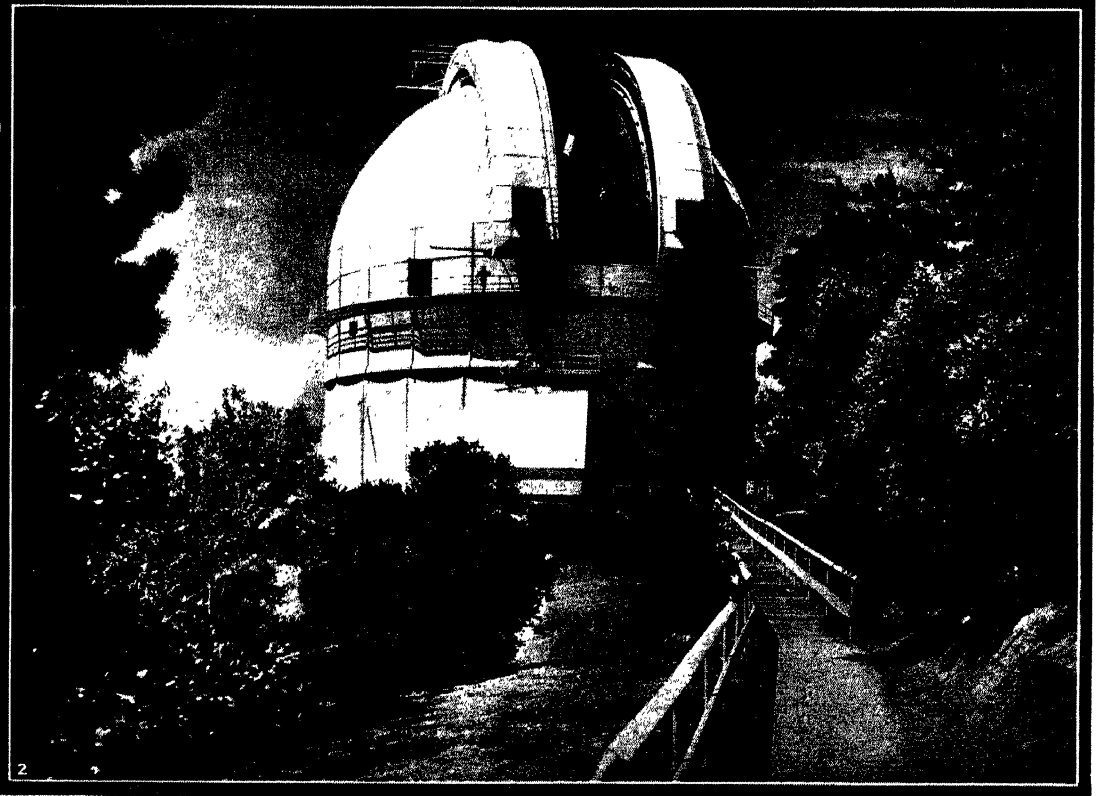
**OBJECT and SUBJECT**, philosophical terms designating the relationship between the object of knowledge and the subject which knows. The subject-object relation has been the source of infection for all epistemological troubles. As one effort to escape from the dualism of the knowing subject on the one hand, and the object to be known on the other, some higher form of being has been conceived in which subject and object are inextricably merged in a higher form of knowledge which knows no such distinctions.

**OBJECTIVISM**, belief in the possibility of knowledge, the opposite of scepticism; the reality of the external world, the opposite of subjectivism. The first conception is epistemological, the second metaphysical. These positions are not mutually exclusive but are rather complementary. From the standpoint of knowledge objectivism has faith in the power of the human mind to arrive at truth; from the standpoint of being it holds that there is an external world to which our ideas correspond. One can know the real world and that world has an existence apart from man's knowledge of it. See also SUBJECTIVISM; SCEPTICISM.

**OBLATION**, a Latin word, meaning offering, sacrifice; in the Catholic Church the offering of the bread and wine by the priest at the Mass with prayers and ceremonies. It begins the second part of the Mass, the old *Missa fidelium*, which also includes the consecration and communion.

**OBOE**, a double-reed musical wind instrument and an important member of the wood-wind section of the ORCHESTRA. It is derived from the *schalmey* of the 17th century, and the name is a corruption of the French *hautbois*, literally, high wood, which in An-

## OBSERVATORY



COURTESY MOUNT WILSON OBSERVATORY

### MOUNT WILSON OBSERVATORY

1. General view of the observatory on Mount Wilson, near Pasadena, California.
2. Dome of the 100-inch Hooker reflector. The reflector records stars of the 21st magnitude

## OBSERVATORY



1, COURTESY LICK OB  
ORY; 2, ASTRONOMER ROYAL, GREENWICH OBSERVATORY

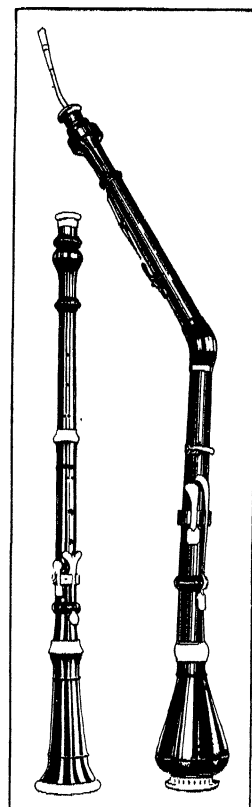
### TWO WORLD-FAMOUS OBSERVATORIES

1. View of Lick Observatory, on the summit of Mount Hamilton in the California Coast Range, at an altitude of 4,209 ft.
2. Royal Observatory, Greenwich, England. New building housing the 26-inch refracting and 30-inch reflecting telescopes.

glicized form became hautboy. Its tone is exceedingly reedy and plaintive, devoid of the limpidity of the flute, on the one hand, and less inclined than the clarinet toward the guttural. Viewed in its physical

characteristics it is a conical tube, of rosewood or ebony, about 2 feet long terminating in a small "bell." The reeds are placed in the mouthpiece, and keys placed along the tube open and close vents which produce the tone wanted. It has a compass from *b* flat to *f*" (see OCTAVE for an explanation of this terminology), but its greatest virtues lie within a smaller compass, namely, from *f*' to *b*" flat. As a solo instrument few surpass it in the wind choirs. Handel wrote six concertos for the oboe, and virtually all the masters have turned to it repeatedly for incidental solo work. The alto oboe, known as the *cor anglais*, has an audible compass from *e* to *a*". It is a transposing instrument, sounding a perfect fifth lower than the notes written for it. Its common orchestral name, English horn, is misleading, since it has no relationship to the horn and is not English. The origin of its name is unknown.

It is slightly larger than



COURTESY M. M. OF ART  
EUROPEAN OBOES  
19th century

the oboe, but in general construction is identical with it.

**OBREGÓN, ALVARO** (1880-1928), Mexican President, was born in Nogales, Sonora, Mexico, Feb. 17, 1880. He was the ablest general in the Constitutionalist army which deposed Huerta in 1914 and put Carranza in power. He was appointed minister of war for the new Government and won several victories over Villa but resigned in 1917 and two years later thereafter became a candidate for President. Carranza opposed him in this but, after the former's assassination, he was elected in 1920 and during his administration effected many economic reforms. After an intervening term by Calles, Obregón was again chosen President in 1928, but before taking office was assassinated July 17, 1928.

**O'BRIEN, EDWARD JOSEPH HARRINGTON** (1890- ), American author and editor, was born in Boston, Mass., Dec. 10, 1890. After leaving Harvard, he became associate editor of *The Poetry Journal*, 1912-15, and of *Poet Lore*, 1914-15. In 1915

he began his series of annual short story anthologies, well known as the *Best Short Stories*. He edited and translated works of drama, fiction, poetry and history, and is author of *Distant Music*, *The Advance of the American Short Story*, *Hard Sayings* and several dramas and volumes of verse.

**OBSERVATORY**, an institution where observations of the heavenly bodies are made. In olden times observations were made with the naked eye and a few crude measuring instruments; in modern times they are made by means of telescopes, photographic cameras and their accessories. The oldest observatories must have been in China, Egypt and Babylonia. The one in Peiping has actually survived until our day. In the 16th century Tycho Brahe's observatory on the island Hven was famous. Among the oldest established observatories in Europe are those of Greenwich, Paris and Leiden.

In America may be mentioned the observatories of Mt. Wilson, near Pasadena, Cal., which possess a 100-inch and a 60-inch reflecting telescope, the former the largest in the world; the Lick Observatory, on Mt. Hamilton, Cal., with a 36-inch refracting telescope; the Lowell Observatory at Flagstaff, Ariz., with a 40-inch reflector. All these observatories are located at high altitudes and in the excellent climate of the Pacific Coast region. Further north is the Dominion Astrophysical Observatory in Victoria, B.C., with a 72-inch reflector; near Chicago the Yerkes Observatory at Williams Bay, Wis., with a 40-inch refractor, the largest in the world at present.

Among the observatories in the East are the Harvard Observatory at Cambridge, Mass., which possesses a number of photographic telescopes and maintains an auxiliary station in the southern hemisphere, in South Africa, where it is now erecting a 60-inch reflector; and the U. S. Naval Observatory in Washington, D.C., with a 26-inch refractor. Among the observatories abroad may be mentioned those at Cordoba, Argentine, Greenwich, England, Babelsberg, Germany, Leiden, Holland, and Johannesburg, South Africa.

**OBSIDIAN**, a black to red, glassy form of volcanic rock. When molten volcanic rock cools with great rapidity, either at the surface of the ground, or in contact with other colder rocks, there is no time for CRYSTALS of the mineral components to form, and it hardens as an amorphous or non-crystalline glass. Obsidian is a form low in water content. Like the other glasses, PUMICE, PERLITE and PITCHSTONE, it frequently shows scattered, incipient crystals, gas bubbles and stony streaks and layers. Large gas bubbles, called lithophysae, sometimes contain beautiful crystals of topaz, quartz, tridymite, feldspars, fayalite or garnet.

Obsidian is sometimes used for mourning jewelry, and ancient man prized it for arrow- and spear-heads and for mirrors. Obsidian Cliff in Yellowstone Park, Wyo., and extinct volcanoes of New Mexico, Utah, Montana and California provide specimens; obsidian also occurs in the Lipari Islands in the Tyrrhenian Sea. See also LAVA; JET.



**OBsolescence**, a term used in technical accounting to describe the loss in value traceable to a change in style or mode, whether in finished goods or in productive machinery or technique. In this respect it differs from **DEPRECIATION**, which is the loss in value due to "wear and tear," or the destructive action of time and the elements. Obsolescence, as a distinct factor in valuation calculations, has been recognized only in recent years, and was brought sharply to attention by the work done in production engineering, which focused attention on the actual cost of each production step, the total of which goes to make up the final "factory cost." Managers have become aware that frequently, long before the useful life of certain machinery has become exhausted, it is producing at the cost of much unnecessary labor and power; and is calling for, in many cases, the use of a much too high grade of raw materials.

More recently, also, the speed with which fashions change has brought about a situation in which an absolutely unforeseen innovation in production methods has rendered obsolete machinery worth millions of dollars. The introduction of, e.g. "full-fashioned" hosiery, made useless all equipment that produced the older type of stockings. A manufacturer who was equipped to make the older type at a price that could compete with the newer and more fashionable style, would find that he could not sell his product in a market that demanded the more recent type as well as a low price. Under the necessity of scrapping his obsolete machinery and buying equipment that would produce to the new demand, he was forced to take an immediate financial loss in the shape of an increased load of invested capital.

Obsolescence, like fires, gives no warning of its approach. It has been proposed by Gorton James (see *American Machinist*, Nov. 29, 1929) that what our advancing industry needs is some form of protection against the unpredictable workings of the obscure law of obsolescence. The U.S. Department of Commerce is now engaged in making a study of the rate at which various machines become obsolete, which may result in the establishment of a fair basis for an insurance rate. It is already known that the rate in the textile industry, from 1860 to 1910, did not exceed 2% per year; but this is too low a figure to cover the changes that have taken place since the later date. In the airplane industry, depreciation from this cause amounts, at the present time, to about 50% per year.

Obsolescence affects most immediately the manufacturer who is producing competitive goods. His original investment is put in jeopardy by every new invention and by every improvement in process—as were the old-line paint manufacturers when pyroxylin enamel was introduced. But the wider effect can be traced through the whole social structure which, in gaining new and better materials or a more efficient method of using old materials, undoubtedly has to carry the immediate burden of making the new equipment called for. However, society undoubtedly

benefits in the long run. The gradual cheapening of goods—the inevitable accompaniment of invention—works for the benefit of all. M. Sc.

**OBSTETRICS**, the term applied to that branch of the medical science which deals with the care of the woman and her offspring during pregnancy, labor, and the lying-in period, also called midwifery.

The history of the development of this major branch of the medical science is interesting and, as in the other branches, of relatively recent development from a scientific point of view.

There are some striking mile posts which are of interest, one of which is the publication in German of the first treatise by Roesslin which was called the *Rosegarten* in 1513. This was translated into English (1654) by Raynald with the title of *The Byrthe of Mankynde*. Ambroise Paré (1540), a many-sided and talented surgeon, established the procedure of version or turning the baby as a method of delivery, though the method had been previously used. An Englishman, Chamberlin (1600), invented the forceps and kept the instrument as a commercialized family. This appliance was independently given to the world by Palfyn, a Hollander, in 1723. Since then many improvements and modifications have been made.

Within the last century SEMMELWEISS of Vienna ardently advocated measures for the prevention of the then almost pestilential child-bed fever. His proposals met with obstinate and narrow minded opposition from the most prominent surgeons. In our own country, Oliver W. Holmes contributed a classic on *The Contagiousness of Puerperal Fever* (1843). His principle thesis affirmed that "the disease known as Puerperal Fever is so far contagious as to be frequently carried from patient to patient by physicians and nurses." A similar conclusion had been reached by Gordon in Scotland in 1795, but attained no publicity. The opposition to Holmes' propaganda was vigorously led by otherwise great obstetricians, among them Meigs (1852). No one would receive any support to-day who denied the infectious and communicable character of puerperal fever, though it still exists and causes approximately 40 per cent of our maternal deaths (**PUERPERAL FEVER**).

Another great advance was the discovery and use of anesthesia (1847) in confinement to alleviate labor pains (in obstetrical practice) by Sir James Y. Simpson of Scotland. This method was opposed by most and there was much controversy both medical and religious. Queen Victoria of England, by her willingness to take chloroform, contributed greatly to the success of this procedure.

The landmarks would not be complete without the mention of the operation of cesarean section which is not, as often thought, derived from the name of Julius Caesar, but from *cesare*, to cut, and consists of delivery of the fetus through an incision in the abdominal and uterine walls. It goes back to antiquity, when it was crudely and rarely done, and has developed in the now beautifully but too frequently performed operation of to-day.

The care of the maternity patient has been most incomplete in the past and consisted of primitive, crude, and often dangerous usages which were applied to the woman in labor especially when difficulties arose. Otherwise she received little or no consideration. To-day we know much better, but for one reason and another good obstetrics does not reach half of the mothers of this country.

Unfortunately, many conditions arise which are abnormal and lead to difficulties of greater or lesser seriousness, so that pregnancy is regarded as potentially pathologic or disease producing. This, together with the decreasing birth rate and the stationary maternal and fetal mortality rates (together with the previously mentioned factors) have led nearly all civilized nations to recognize the need for good obstetrics. Of late years prenatal or antenatal care, i.e., the care of the prospective mother, has been stressed. Among the first to recognize its great importance was Ballantyne of Edinburgh (1900).

In addition and prior to prenatal care there is pre-conceptional care, the aim of which is to see that the potential mother is normal and free from inheritable and disease conditions, and is intended to promote individual and race betterment.

Strictly speaking, prenatal care begins with conception. Rest, fresh air and sunshine, moderate and appropriate exercise, proper clothing and footwear, and diet including fluids are all important in the care of the mother during pregnancy. Overweight and underweight should be controlled by a proper diet which includes among other essentials vitamins in fresh foods, minerals as calcium, phosphorus, iron, iodine and proteins, with some starches, sugars, and fats plus a normal amount of bulk. In other words, a balanced diet. The prospective mother should place herself under competent medical advice so that she can receive the necessary examinations and be given the advice appropriate to her needs. Prevention and early detection of abnormal conditions are thus possible, and many casualties and tragedies could be avoided. There would be a reduction of abortions and premature labors. The so-called toxemias of pregnancy would be detected earlier and many of the 25 per cent of mothers who lose their lives from this cause would be saved and much of the damage done to both mother and infant could be prevented (*see PUERPERAL FEVER*).

After prenatal or antepartum care follows intrapartum or delivery care, which may be safely carried out in either a well-equipped maternity hospital or in the home by competent personnel. The important things here are surgical cleanliness, watchfulness, prevention and treatment of birth injuries and hemorrhage. Anesthesia is important but requires good judgment in the selection of the anesthetic agent as improper or injudicious use may imperil mother or infant. Operative deliveries may be necessary, but most labors will terminate safely without such interference.

Obstetrics reaches its climax, with the safe delivery

of the infant which has, together with its mother, been protected in all stages from conception to birth. The mother, too, has undergone psychic and physical changes during this period which make certain lasting alterations in addition to transient changes.

Following the delivery of the child the afterbirth or PLACENTA is born, usually within a few moments to half an hour. The postpartum period now begins for the mother which is technically called the puerperium. The fetus becomes an infant with the establishment of respiration and enters upon the post-natal or neonatal phase of its existence and is commonly known as the newly born.

This is a critical and transitory period, but with appropriate care it is not serious for either babe or mother. About the third day after birth the breasts begin to function and lactation is gradually established. The infant generally thrives best on mother's milk, but this is sometimes inadequate or the supply gradually fails and then it becomes necessary for the infant to receive supplemental or substitute feeding.

The mother should remain in bed for about ten days, after which she may gradually resume her duties. It is advisable for her to be re-examined a month or six weeks after confinement and even later, as it is often a number of months before normality is restored.

At birth the infant should have its eyes properly cared for, as many cases of blindness are due to infections dating from birth. The navel cord should have proper care to avoid the possibility of bleeding or infection. The cord drops after drying, but it is not usually healed for a week or two. (*See CHILDREN, DISEASES OF: Diseases of the newborn.*)

Obstetrics, then, has the two-fold responsibility of maternal and infant life. This responsibility is spread over many months and ideally includes the pre-conceptional, antepartum, intrapartum, and postpartum care for the mother and the equivalent of antenatal, intranatal, and postnatal care for the offspring. *See also* MATERNAL AND INFANT WELFARE. F. L. A.

**OCALA**, a city in central Florida, the county seat of Marion Co., situated near the Ocklawaha River, about 100 mi. northeast of Tampa and southwest of Jacksonville. Bus lines, small river craft and two railroads afford transportation. There is also an airport. Ocala ships fruits, vegetables, dairy products, poultry and live stock grown in the vicinity. The city has plants producing lumber products, phosphates and turpentine. Silver Springs, 5 mi. east of the city, is a basin of unusually clear water. Ocala was founded in 1846 and incorporated in 1848. Pop. 1920, 4,914; 1930, 7,281.

**OCCASIONALISM**, one of the historical explanations of the relation between mind and body. This explanation is closely associated with the Cartesian School. Geulincx and Malebranche were its leading exponents. (*See* CARTESIANISM.) These Cartesians were not satisfied with Descartes's explanation for the influence of the mind and body on each other. For the pineal gland as the connecting link between the

material and the psychical series, they substituted the deity, thus giving rather a long circuit for the transactions between these unlike substances. They accepted Descartes's dualism in setting up two independent series. Mind is not the cause of any change in the physical series, nor is a physical condition the cause of any change in mental states. The one is merely the occasion for the action of the other. The connection takes place by the intervention of the deity.

**OCCIDENTAL**, an INTERNATIONAL LANGUAGE invented in 1922 by Edgar de Wahl, an ex-naval officer and former professor of mathematics and physics at Reval. It is based upon the theory that an international language should preserve what is common to Occidental languages, and thus seeks to take words from them either bodily or with as little change as possible. Avoiding the artificial rigidity of ESPERANTO and its modification Ido, it permits great flexibility in the use of suffixes, etc. A journal, *Cosmoglossa*, is published every two months in this language.

H. S. E.

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**OCCIDENTAL COLLEGE**, at Los Angeles, Cal., a coeducational institution, was founded in 1887 as the Occidental University of Los Angeles. It became the Occidental College of Los Angeles in 1892. The college is privately controlled, and affiliated with the Evangelical Church, but non-sectarian. The productive funds in 1931 totaled \$1,260,000. The library contained 33,521 volumes. In 1931-32 the student enrollment numbered 631, and the faculty of 64 was headed by Pres. REMSEN DU BOIS BIRD.

**OCCLEVE, THOMAS** (c. 1370-c. 1454), English poet, was born about 1370. In his youth he was a friend of GEOFFREY CHAUCER, whose death he laments in the prologue of his principal work, *De Regimine Principum*. This poem is chiefly a new version of the Latin treatise *The Governail of Princes*. The beautiful prayer to the Virgin beginning "Mother of God and Virgin Undeformed" has been attributed by some critics to Occleve, by others to Chaucer.

**OCCCLUSION**, is the term applied in chemistry to the absorption of a gas by a solid or a liquid, such as a molten metal, and covers two distinctly different phenomena. In the one case the absorption may be compared to a true solution, while in the other case large quantities of gas merely disappear in porous cavities, probably in the form of some kind of condensation. Among the best known examples of the former type are the occlusion of oxygen by molten silver—the gas being liberated again with great force when the metal solidifies; that of carbon dioxide by cast iron at red heat, and of hydrogen by the platinum metals, notably palladium. This metal can absorb nearly 1,000 times its own volume, thereby swelling up to the extent of a 10% increase in bulk; the "alloy" formed is quite stable. The other kind is perhaps best known through the ability of charcoal to absorb gases, notably ammonia and oxygen, but

also many others. Upon the fact that helium and neon are not so absorbed is based the use of charcoal in the purification of these rare gases.

**OCCULT**, a type of learning directed to a hidden and supernatural world. It seeks a knowledge of mysteries and the control of forces beyond those ordinarily recognized. The ancient occult proceeds upon the assumption that the secrets of nature must be guessed, that relations exist which once revealed will confer great powers. **ASTROLOGY** and **ALCHEMY** form one solution of such quest; the adept circles of higher learning in the Oriental tradition form another. Secret doctrines, or hermetics, and such lore as that of the **KABBALLAH** in Jewish tradition, represent the mythical phases of occult teaching.

Modern occult tendencies are best illustrated in **THEOSOPHY**, but appear as well in the survivals and revivals of ancient occult systems, and in sporadic theories claiming special revelations. Occultism seems attractive to a type of mind that rejects the ordinary explanations of science and finds a mystic exaltation in vague yet imposing concepts appealing to a sense of personal power and understanding, by way of mystic, abstruse and ambitious doctrines. The occult and the scientific temper are opposed. J. J.

**OCCULTATION**, a term used in astronomy when a relatively large celestial body interposes itself between a smaller celestial object and the earth, thus cutting the other object off from view. Thus the moon may occult stars or a planet, by passing in front of them; Jupiter may occult a star or its satellites.

**OCCUPATIONS**, the ways by which men and women maintain their individual existences. In modern society this generally takes the form of rendering some service in order to maintain a living at a given standard. The desire to achieve economic security and to accumulate a competence for old age, or at least to enjoy a day-by-day livelihood, is the principle motive leading to the choice of a particular occupation. The second motive is psychological, a search for a congenial outlet for the energies of an individual, the desire to banish the tedium of idleness, or an attempt to enlarge and enrich one's life by attaining the satisfactions of achievement or service.

In well chosen occupations, both types of motive are present. Frequently the economic pressure on an individual seeking an occupation prevents a wise and deliberate choice. The job-hunter contends against time, with the result that maladjustments and consequent economic waste characterize many occupations. A recent survey suggests that four persons out of ten are unhappy in their occupations. This is a cause for much personal dissatisfaction and social unrest in the modern economic system.

**Old and New Occupations.** The older occupations such as farming, fishing, trading, soldiering, seafaring, exploring and the like continue to persist, but countless new occupations appear, some of which displace earlier vocations while others are responses to new needs. The blacksmith goes, but the service station man, the **MECHANIC** and others take his place.

Invention creates labor-saving machinery that does away with many jobs, but a new invention creates air travel. Automobile factories employ numberless men in unique jobs. Occupations in electricity, engineering, moving pictures, radio and aviation exist to-day which were not dreamed of 30 years ago.

**Vocational Training** has become highly developed in the past few years. Special training courses along specific commercial and industrial lines have been added to the high school program. Junior colleges offer occupational courses as terminal courses and have increased the opportunity and equipment of the younger generation. Trade schools, part-time vocational courses and continuation schools have sprung up in every large city. Colleges and universities have added new types of professional courses and schools, typical of which are the course in advertising and journalism at Columbia University, the Harvard School of Business Administration and the Wharton School of Finance at the University of Pennsylvania. Correspondence schools, as well as home study extension courses of certain universities, of which a prominent example is Columbia University, give opportunity for spare-time education in theories and basic principles of business and professional occupations.

The chief fields of occupations are difficult to define precisely. Superficially they are easily subdivided, but actually the work in any one field varies greatly and often overlaps other fields as, e.g., a musician, who is, generally speaking, trained as a professional, may find himself working in an ensemble producing music for phonograph or film recording—obviously an industrial occupation with a business aspect, since he must bargain for his price, or for his share of the price at which the record is sold. An engineer may find that his professional work sends him more and more into the field of industry, from whence he drifts into the occupation concerned with transportation, to emerge finally as a traffic manager for a railroad.

Considered, however, from the point of view of the type of work basically demanded by an occupation, all occupations may for convenience be classified into six large groups:

**1. Industry**, the original field of human activity, which grew up while the state of man was still primitive. In industry as such muscular strength is usually necessary, and mental qualities need be no more than sufficient to follow a rule of thumb, or to adhere to the directions of a business or professional man who has special training, and who, by this token, is in charge of a particular industrial activity. In this field falls most manual work, such as that of farming, hunting, mining, logging and similar occupations concerned with the extraction of raw materials for fabrication or refinement. It also includes the manufacturing processes as in carpentry, flour milling and the like, by which these raw materials are converted into products fit for use.

**2. Public Service** includes a vast series of occupations classified in one group because it is organized

by society as a whole generally on a non-profit basis for the purpose of supplying necessary services conceived to be better rendered by organization under public auspices than under private profit motives. Characteristic of this field are the police and fire departments, the military, naval and postal services, and all public health and sanitary work. A greater mental capacity is needed here, though perhaps somewhat less physical strength, and the directing heads must often possess a high degree of mental training, e.g., the directors of public health departments, admirals of the navy or the like. The civil service list of the Federal government however is exceedingly varied, including practically every type of vocation.

**3. Personal Service** includes the occupations which involve a more or less direct ministry to personal wants as distinguished from the more remote, indirect and impersonal services of industry and business. Domestic servants, manicurists, and employees of hotels, restaurants, laundries, cleaning and dyeing establishments, are typical of those engaged in personal service. Professional services, which are indeed personal services in the broad sense, are not included under this category, because of the more complex qualities required by them in contrast with those simpler abilities usually regarded in personal services as here defined.

**4. Transportation and Communication** represent a recent segregation from the field of industry. They call for the services required to operate the organized means whereby men overcome the barriers of distance. The operation of the actual machinery of this field is carried on by those usually regarded as industrial workers, but the direction of the means of transport and communication demands a mental agility and a power to solve problems containing many variables which does not characterize the ordinary worker in this field. But all employees in this domain need to have a high regard for the social significance of their services, for any failure upon their part is highly disruptive of the social cooperations which depend upon railroad, bus, steamship and airplane transport and upon telephone, telegraph and radio communication. This is made evident by the superior esprit de corps of public utility organizations in "keeping the service going."

**5. Business** is now one of the most inclusive fields of human activity. It includes in the narrow sense all the services involved in the distribution of goods other than those of transport. Operating on a highly competitive basis, the desire for pecuniary success is needed in those who assume the financial risks. The direction of business calls for native shrewdness as well as reasonable physical strength to withstand the strain engendered by life in the market place. The opportunities of business are so varied that men and women are drawn into it from every walk of life, too often irrespective of the training they may have had. The business population thus includes among others those who: 1. Perform the actual physical labors involved; 2. Act as secretaries, stenographers or clerks;

3. Manage mills or other operations calling for technological knowledge and skill, 4. direct purchasing, advertising, marketing or the freight movements of a business, and those who carry on other necessary functions.

**6. The Professions** grow in number and use in the modern world. As our knowledge of the physical world and human relations increases we have greater need of the skilled services of the highly trained intellectual expert such as ENGINEERS, DOCTORS, NURSES, SCIENTISTS, TEACHERS, LAWYERS, SOCIAL WORKERS and the like. These render the highest types of personal or scientific service, through private practice or public employment, in individual or group service. Because of the responsibility for individual or social welfare which accompanies the practice of their professions, public licenses to practice are required. A high ethical sense is also demanded, and it is reinforced by a professional code of ethics. A long liberal training, and some degree of specialized professional training of university grade, followed in many cases by a supervised apprenticeship, constitutes the preparation for these desirable occupations.

**Education and Income.** A study made in 1928 by the national professional commercial fraternity, Alpha Kappa Psi, reveals that occupations such as day laborer, factory hand, automobile mechanic, chauffeur, motorman and the like, open to young men having only elementary school education, are much more restricted than 30 years ago. The average income of the man under 25 years of age, in this group is \$1,120, reaching a maximum of \$1,700 at 40 years. High school graduates become salesmen, retail store proprietors, managers, bookkeepers, bank tellers and many forms of clerical workers. The average income of the man under 25 years of age in this group is \$1,430, reaching a maximum average of \$2,800 at 45 years. College graduates become teachers, school superintendents, LIBRARIANS, ADVERTISING MEN, department store buyers, credit managers, architects, engineers, EDITORS, REALTORS, bond salesmen, government officials, CHEMISTS and HOTEL MANAGERS. The average income of the man under 25 years of age with an A.B. degree is \$1,750, reaching a maximum average of \$6,200 at 60 years. Due to the scarcity of college graduates, 60 years of age, available for investigation, this last figure is not as reliable as the others.

To summarize the effect of each addition to a formal education in increased earning power: The untrained man from 14 years to 60 years with elementary education earns on the average a total of \$64,000. The man from 18 years to 60 years with high school education earns on the average a total of \$88,000. The college or technical school graduate from 22 to 60 years earns, on the average, from \$160,000 to \$200,000. Thus the cash value of a high school education as compared with an elementary school education is \$24,000, \$6,000 for each of the four years of the course. The cash value of a college education as compared with a high school education is at least \$72,000, or \$18,000 for each of

the four years of the course. It must be remembered that here these differences in earning power are not due merely to longer periods of school training, but also to original differences of personal ability which made prolonged school success possible.

**Women in Business.** The growing employment of women in business as distinguished from other fields which they had previously preempted, such as the lighter industries, manicuring, nursing, housework, styling and the like, is a social and economic fact of importance. It indicates a more tolerant attitude toward women with jobs. It does not, however, indicate any real equality with men in vocational or economic opportunity. Investigations of the records of organizations such as the Junior Placement Bureau of the New York State Department of Labor, the employment bureau of the Heckscher Foundation, the Young Women's Christian Association and the National Industrial Conference Board reveal that unskilled or semi-skilled girls in their teens normally get a foothold in industry easier than boys of the same age, the girls being more mature for their years and often having had a longer schooling.

Girls are preferred in the lesser-paid forms of clerical work. In times of economic depression a higher percentage of girls than boys is able to find employment, but this higher percentage is attained through day work or casual jobs. Here the advantage ends. A girl's foothold in business is more precarious than a boy's. With an equal or perhaps easier start, girls are soon left behind when the higher wage levels are reached. In nearly all branches of clerical work men are paid more than women.

In the highest paid group of each clerical occupation, according to the National Industrial Conference Board, the percentage of women employed is smaller than for men, file clerks being the one exception. In this particular occupation the percentages are about the same, "which would indicate a special adaptability on the part of women for this particular type of work." Normally, then, women are at no disadvantage so far as obtaining work in occupations paying up to about \$50 a week. Beyond that point in the wage scale they are at a distinct disadvantage. This is due not so much to the traditional control of business by men as to the temperamental handicap carried by women. Most women do not expect to work all their lives. When seeking an occupation a woman does not plan her whole life in relation to it. Furthermore, she usually lacks the masculine stimulus, the probability of having to support a wife and a family. When this stimulus is present, as in the case of women with children to support, they often make very successful business women. A survey made in 1927-30 by the University of Michigan in connection with the National Federation of Business and Professional Women's Clubs, shows the earnings of the average woman in this group, excluding industrial workers, to be \$1,548 per year. One out of four earns less than \$1,213 per year. The same percentage earns more than \$2,004 per year. The average woman

in business for herself earns \$503 more than the average woman who is employed by others. About one out of three in business for themselves earn more than \$3,000 per year, as contrasted with about one out of 20 employed by others. R. PL.; M. Sc.

**OCEAN, GEOLOGICAL WORK OF,** a tremendously important phase in the ceaseless cycle of destruction and rejuvenation of the continents. Their shores are continually being worn away by the EROSION of waves and currents. Sea water has a solvent action on many rocks, but the most important effect is the mechanical action of waves. These have a tremendous striking power, especially during storms, and when provided with sand, gravel, and boulders as tools, they grind and smash the rocks along the shore. The debris thus formed is carried out by the undertow, and so the way is continually cleared for more destruction. In this manner the land is cut back at the ocean's level. Just below the zone of intensive wave action is a shallow area where the debris is swept about, known as the "Wave cut terrace." Further out, where the bottom lies deeper, below the action of wave and current, the material is dropped, and forms the "Wave built terrace."

Lighter material, carried by currents along shore, may build up beaches, barriers, bars, and spits. The SAND and SILT of which these are composed may have been derived from the destruction of the shore, or may be the sediments carried into the sea by rivers and streams. Further out, finer material, as silt and mud are laid down, and calcareous shells often accumulate into beds of LIMESTONE. The most important constructive work, however, is the formation of sediments in the comparatively shallow seas which periodically invade the continents in the course of geological ages. There the SANDSTONES, SHALES and limestones are formed which are later uplifted to form dry land. *See also* GEOLOGY; SEDIMENTATION.

**OCEAN CITY,** a rapidly growing summer resort city of Atlantic Co., N.J., situated on a sand island in the Atlantic Ocean separated from the mainland by Egg Harbor, 55 mi. southeast of Philadelphia. It is served by the Pennsylvania and Reading railroads and by motor bus lines and is connected with the mainland and neighboring islands by several large highway bridges. There are numerous hotels, boarding houses and cottages accommodating many thousands of summer visitors. Pop. 1920, 2,512; 1930, 5,525.

**OCEANIA or OCEANICA,** a geographical area occupying the southwestern quadrant of the Pacific and embracing the scattered land surface remaining after the apportionment of the continents of Europe, Asia, Africa, America and Australia. Its major divisions are the Malay Archipelago including the Philippines; Melanesia including chiefly New Guinea, New Hebrides, Solomon and Fiji islands; Micronesia, made up of a belt of small islands north and east of Melanesia; and Polynesia, including the Hawaiian Islands and scattered groups as far east as 130° E. long. These divisions express ethnological rather than political or geographical differences.

**OCEANIC NEGRO.** *See* RACES OF MANKIND: *Negroid Group.*

**OCEAN ISLAND,** a British island of the South Pacific Ocean, the capital of the Gilbert and Ellice Islands colony. It is 6 mi. in circumference and contains immense deposits of phosphate, which are exploited by the British Phosphate Commission. There is also an important wireless station. Pop. 1927, 2,467 (113 Europeans).

**OCEANS AND OCEANOGRAPHY.** Oceans form the major divisions of the liquid surface of the earth. Oceanography is that branch of science which deals with the study of the various aspects of oceans: their extent, depth, composition and temperature, their tides and currents, as well as the flora and fauna existing in them. The total water area of the globe is about 140 million square miles, 5/7 or 71% of the total surface of the earth; of this, 43% lies north of the equator, 57% south.

Although there is some diversity of opinion as to what constitutes an ocean, only three oceans are now generally recognized, viz. the Atlantic, the Indian and the Pacific oceans. The Arctic Ocean, having an area of only 4 million square miles, has been incorporated with the Atlantic as the Arctic Sea. The Antarctic Ocean, largely reduced in size since the discovery of the Antarctic Continent, has been reapportioned over the three others. Another reason for the suppression of the name ocean for the polar seas is the short distances between the southern tips of South America, Africa and Australia and Antarctica, 400, 2200, and 1500 miles respectively, as against the much greater north-south extension of each of the oceans, ranging from 6200 for the Indian to 12,500 for the Atlantic. The approximate areas now recognized are: Atlantic, 40 million square miles; Indian Ocean, 29 million, and Pacific, 71 million. The average depth of the oceans does not differ greatly, being respectively 2200, 2300, and 2500 fathoms; but the greatest depth at present sounded ranges from 3800 fathoms for the Indian Ocean and 4650 for the Atlantic, near Porto Rico, to over 5700 fathoms for the Pacific, near the Philippines.

The total amount of water in the oceans is estimated at 324 million cubic miles, enough to cover the entire earth with a depth of 2 miles of water if the land had first been leveled off smoothly. The total mass of all the water is about 1.5 quintillion tons or 1/4300 part of the mass of the earth. The main features of the surface of the earth may be summed up by saying that there are three principal levels: the continental plateau, some 2200 feet above sea level, (29%); the bottom of the ocean, some 2160 fathoms or 12,480 feet below sea level, (56%), and the continental slope, or shelf, connecting the two. In the oceans themselves nearly 80% of the area has a depth between 1,000 and 3,000 fathoms, and only about 6-7%, called "deeps," a depth greater than 3,000. These greatest depths generally occur around the edges of the oceans, while the central basins are shallower.

Where oceans and continents meet, the irregular

borderline sets aside certain portions of the water surface which are called seas. (*See SEA.*) The largest of these is the Arctic Sea; others, largely surrounded by land are the Mediterranean, the West Indian or Central American Sea, including the Gulf of Mexico, and the Malay Sea. The east coast of Asia is characterized by four fringing seas, marked off from the Pacific by rows of islands and peninsulas, viz. the Bering Sea, the Sea of Okhotsk, the Sea of Japan with the Yellow Sea, and the China Sea. Still other varieties of seas are the deep gulfs, with only one outlet, such as the Red Sea, the Persian Gulf, the Baltic and Hudson's Bay.

These seas differ from the oceans not only in their shallowness but also in their salinity, which is low for cold arctic seas with little evaporation, and high for tropical seas with rapid evaporation. The oceans themselves are fairly uniformly salty, and contain approximately 3.5% of soluble substances, largely sodium chloride, with admixtures of magnesium, calcium, potassium chlorides and sulphates. The salinity of the oceans is continually increasing, since evaporation withdraws only pure water and, after this has been condensed and precipitated into rain or snow, and returned by way of rivers, a certain amount of soluble salts and suspended, solid substances are carried down with it. The total amount of water in circulation annually is estimated at 6500 cubic miles. In addition to the salts, sea water contains a number of gases in solution, chiefly nitrogen, oxygen, and carbon dioxide, the last two being indispensable to marine life.

The color of pure seawater is blue and becomes enhanced by greater salinity. Actually minute impurities, mostly of organic nature, may cause the color to turn to green or even brown, as when PLANKTON is present. Water is only slightly compressible; yet the enormous pressure exerted at great depths, due to the great weight of the column of water above, causes the level of an ocean five miles deep to be 500 feet lower than it would be if there were no gravity to give weight to the water. This very high pressure, about one ton per square inch for every mile of depth, as well as the complete absence of sunlight at depths exceeding 100 fathoms, considerably modify the conditions under which DEEP-SEA LIFE flourishes.

The temperatures of the oceans differ greatly at the surface, being 28° F in the polar seas, and up to 85° F in shallow tropical seas. Where the surface is warm, the temperature decreases rapidly with increasing depths, and even in the tropics has fallen below 40° F at a depth of half a mile. In seas whose communication with the ocean consists of one narrow channel with a "threshold," higher than the sea-bottom, the temperature at depths below this threshold is often constant, being some 55° F in the Mediterranean from 200 fathoms to 2,000.

Apart from the very slow circulation due to perennial differences in temperature, motions of the water of the ocean take place as a result of winds. The steady CURRENTS and streams are a result of prevail-

ing winds; the instantaneous movements of the superficial layers may vary greatly owing to local and variable wind conditions.

The ocean floor, though consisting of hard rock, is covered everywhere with a deposit called Ooze, consisting largely of the remains of dead animals and plants and inorganic material washed down to sea by the rivers or from the beaches, or having a meteoric or volcanic origin. The actual composition of the covering of the ocean bottom and the types of animal life existing there are explored and ascertained by means of deep-sea SOUNDING AND DREDGING.

According to geological evidence the Pacific is probably the oldest, the Atlantic the youngest ocean, while the seas and gulfs are still more recent. It appears furthermore that in tropical regions the oceans are gaining on the land, while the reverse holds true for the temperate zone.

W. J. L.

**OCEANSIDE**, a seaside resort in San Diego Co., southern California. It is situated on the Pacific Ocean and the San Luis Rey River and is served by bus and truck lines and the Santa Fé Railroad. The chief crops of the region are beans, alligator pears, oranges and tomatoes. Oceanside has 4 mi. of clean beach free from undertow. The vicinity has several interesting features including Carlsbad Mineral Springs and Luis Rey Mission. Oceanside beach is publicly owned. The town was incorporated in 1889. Pop. 1920, 1,161; 1930, 3,508.

**OCEANUS**, in Greek mythology, son of URANUS and GAEA, and husband of Tethys, father of the Oceanids and of all great rivers. The early conception of Oceanus was as a huge river round the earth; later he was identified with the sea in general and the Atlantic Ocean in particular.

**OCELOT** (*Felis pardalis*), an American wildcat, native to the forests of Mexico and Central and South America, called also tiger-cat and leopard-cat. It is the size and shape of an overgrown house cat, with



OCELOT, OR LEOPARD-CAT

the upper parts and tail yellowish gray, sides and lower parts white, and everywhere marked thickly and variably with elongated rings and spots bordered with black. The ocelot is strictly nocturnal in seeking its prey; it is savage, yet often is tamed as a pet, although addicted to raiding poultry-yards, as birds are its favorite food. Two young are produced annu-

11

12

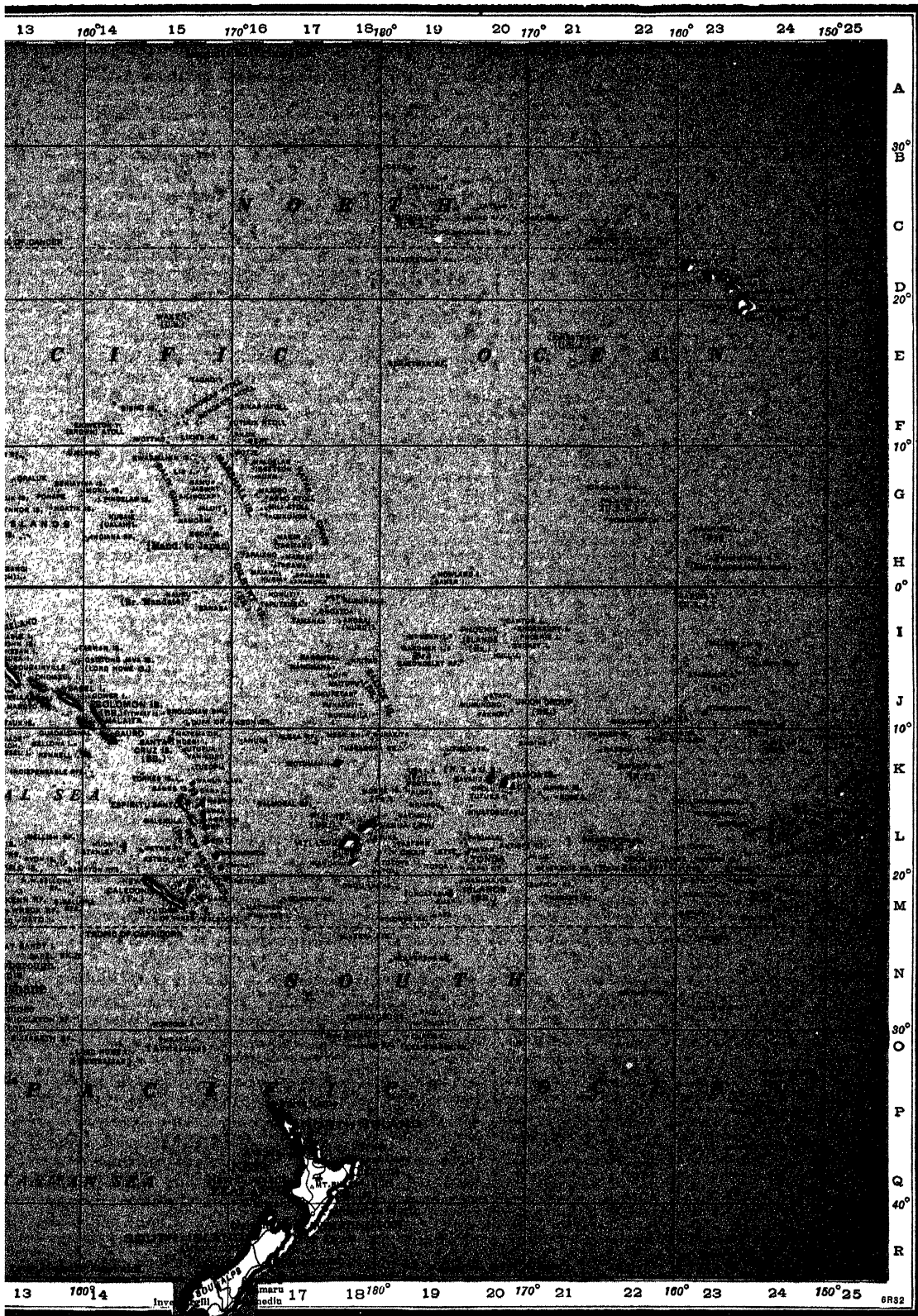


# OCEANIA

## COUNTRIES

AUSTRALIA	N 8	Ar. 2,974,581 sq. m.	Pop. .... 6,488,999
BISMARCK ARCH.			
BRITISH NORTH BORNEO	G 5	Area 31,106 sq. m.	Pop. .... 270,223
BRUNEI	H 5	Area 2,500 sq. m.	Pop. .... 30,000
CAROLINE IS.	G 12	Area . 380 sq. m.	Pop. .... 38,438
DUTCH EAST INDIES	I 5	Area 733,642 sq. m.	Pop. .... 60,731,025
FIJI IS.	L 18	Area 7,083 sq. m.	Pop. .... 180,000
GILBERT AND ELLICE ISLANDS	I 18	Area . 457 sq. m.	Pop. .... 29,345
GUAM	F 11	Area . 206 sq. m.	Pop. .... 18,509
HAWAII	D 23	Area 6,406 sq. m.	Pop. .... 368,336
MARIANAS (MARIANNE) IS.	E 11	Area . 245 sq. m.	Pop. .... 64,819
NEW CALEDONIA	M 15	Area 8,458 sq. m.	Pop. .... 51,816
NEW GUINEA	I 9	Area 100,692 sq. m.	Pop. .... 249,181
NEW GUINEA, TERR. OF	I 11	Area 91,000 sq. m.	Pop. .... 490,000
NEW HEBRIDES	L 15	Area 5,700 sq. m.	Pop. .... 64,560
NEW ZEALAND	Q 17	Area 103,862 sq. m.	Pop. .... 1,521,887
PAPUA TERRITORY	J 11	Area 90,540 sq. m.	Pop. .... 276,366
PELEW IS.	G 9	Area . 175 sq. m.	Pop. .... 6,361
PHILIPPINE IS.	F 6	Area 114,400 sq. m.	Pop. .... 12,082,366
SAMOA	K 20	Area . 75 sq. m.	Pop. .... 10,055
SAMOA, W.	K 20	Area 1,133 sq. m.	Pop. .... 45,649
SARAWAK	H 4	Area 42,000 sq. m.	Pop. .... 600,000
SOCIETY IS.	L 24	Area . 686 sq. m.	Pop. .... 31,703
SOLOMON IS.	J 14	Area 14,400 sq. m.	Pop. .... 189,219
TIMOR	J 7	Area 33,740 sq. m.	Pop. .... 1,108,240
TONGA IS.	L 20	Area . 385 sq. m.	Pop. .... 27,457





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ally. This beautiful cat is much hunted for the sake of its fur. E. I.

**OCHER**, deep red, yellow or brown earths used for pigments. The ochers usually consist of CLAY colored by LIMONITE or HEMATITE. The Indian red, sienna, and umber of commerce are ochers. The name is also applied to earthy material colored by other metals, such as chromium, molybdenum, lead and bismuth. Chrome ocher, for example, is green. Commercial ochers are usually found in connection with iron ORES, occurring as residual concentrations between soil and bed rock, and are often called "paint ore." They may be made artificially by roasting PYRITE, SIDERITE and SHALES. Pennsylvania and Georgia are important mining-centers for ocher. See also DEPOSITS; ORE DEPOSITS.

**OCHRIDA**, a town of YUGOSLAVIA, in Macedonia, picturesquely situated on the northern shore of Lake Ochrida. In Turkish days, before 1912, Ochrida was one of the important towns of Macedonia, being the capital of a *kaasa*, but following the Balkan War in that year, the boundary line between Serbia and Albania passed close by and the town has since declined in importance. The industries include tanneries, fisheries, weaving and spinning. Silk cocoons are cultivated in the environs.

In ancient times Ochrida was known as Lychidnos and formed part of the empire of Philip II of Macedonia. In the 9th century the Bulgars invaded the town and demolished it. When Tsar Samuel of Bulgaria reestablished the western Bulgarian empire toward the close of the 10th century he made Ochrida his capital. The town still possesses the ruins of Samuel's palaces. Upon the death of Samuel early in the 11th century, Ochrida was taken for Byzantium by the Emperor Basil II of Constantinople. The Turks occupied Ochrida in the 14th century and held it until 1912 when during the first Balkan War the Serbians took it. In the World War Ochrida was seized by the Bulgarian armies. On the site of Samuel's court a great celebration was staged by the Bulgarians, but they were forced to cede the town back to Serbia by the treaties of Versailles. The population of Ochrida at one time was above 20,000, but in 1931 numbered only 9,776.

**OCHRIDA, LAKE**, in Macedonia, at the extreme southwest corner of the Yugoslav kingdom. The southern tip of the lake is in Albanian territory. The area of the lake is 107 sq. mi.; its depth reaches almost 1,000 ft. It is 18 mi. long and 8 mi. wide. Picturesque mountains line its western shore, while the Monastery of St. Naum, a Bulgarian shrine, is perched on its eastern shore. At the southern end is the Albanian town of Pogradetz. Ochrida and Struga are on its northern shore. The Black Drin issues from Lake Ochrida and flows north to Prizren, where it meets the White Drin. The lake is locally famous for its salmon trout.

**OCHS, ADOLPH SIMON** (1858- ), American newspaper publisher, was born at Cincinnati, Ohio, March 12, 1858. He became a compositor with the

Knoxville *Tribune*, and was transferred to editorial work. He then began working for the *Chattanooga Times*, and in a short time became editor, publisher and owner. He purchased the New York *Times* in 1896, and developed it into one of the most valuable newspaper properties in the world. He was elected a director of the Associated Press in 1900. The following year he acquired the Philadelphia *Times*, and in 1902 obtained control of the Philadelphia *Public Ledger*. He consolidated the two papers into the *Ledger*, which he sold in 1912 to C. H. K. Curtis. In 1919 Ochs was made a commander in the Legion of Honor.

**OCONEE BELLS** (*Shortia galacifolia*), an attractive but very rare plant of the diapensia family known also as little colt's-foot. A single specimen was found in the North Carolina mountains by André Michaux, a French botanist who traveled in America from 1785 to 1797. When visiting Paris in 1839, Asa Gray saw the specimen collected by Michaux, but as yet unnamed. Later Gray tried long to find the plant but was unsuccessful. The plant was rediscovered in 1877 and has since been sparingly introduced into cultivation. It is a low stemless perennial with nearly round, heart-shaped, shining root leaves and white bell-shaped flowers borne singly on stalks rising above the leaves.

**O'CONNELL, DANIEL** (1775-1847), Irish statesman, was born near Cahirciveen, Kerry County, Ireland, Aug. 6, 1775. Of an ancient family, he studied in Ireland and then in France. In 1798, he became a member of the bar in Ireland and in spite of difficulties organized a movement for the rights of Irish Catholics who were suffering great injustice. He became a Whig, and his speeches attracted much attention in the House of Commons. Great meetings of the people which he organized in Ireland during 1842-43 ultimately led to his imprisonment. After that his influence diminished. Ill health and advancing age finally forced his retirement from politics and he went abroad. He died at Genoa, May 15, 1847.

**O'CONNELL, WILLIAM HENRY** (1859- ), American cardinal, was born at Lowell, Mass., Dec. 8, 1859. He was educated at Boston College, St. Charles College, Ellicott City, Md., and at the American College, Rome, where he was ordained Jan. 8, 1884. Two years later on his return to the United States, he was located at churches in Medford and Boston, and in 1895 was appointed Rector of the American College, Rome, two years later being named domestic prelate to the Pope. Consecrated Bishop of Portland, Me., in 1901, he was named four years later, assistant to the Pontifical Throne, and sent as a special Papal Envoy to the Emperor of Japan, who honored him with the Grand Cordon of the Sacred Treasure. On his return he was made in 1906, Bishop of Constance and coadjutor with the right of succession to Archbishop Williams of Boston, and succeeded him the following year. He is the author of *Sermons and Addresses*, and *Religious Ideals in Industrial Relations*. Archbishop O'Connell was elevated to the cardinalate Nov. 27, 1911.

**O'CONNOR, THOMAS POWER** (1848-1929), Irish journalist, was born at Athlone, Oct. 5, 1848. He was educated in Ireland and entered journalism in Dublin in 1867, going to London three years later. In 1880 he entered politics as a member of Parliament for Galway, and sat for Liverpool from 1885 until 1900. He founded and edited a number of publications, wrote many books, including a notable life of Lord Beaconsfield, and was the author of numerous essays and articles of a high order. He died in London, Nov. 18, 1929.

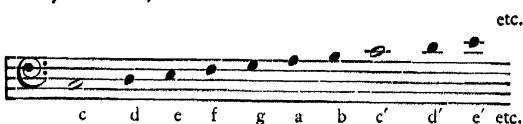
**OCONTO**, a city in northeastern Wisconsin, the county seat of Oconto Co., situated on Green Bay of Lake Michigan, at the mouth of the Oconto river, 28 mi. northeast of the city of Green Bay. Two railroads afford transportation. The vicinity is good farming and dairying country. Lumbering and fishing are the chief local industries. Oconto was settled about 1846 and incorporated in 1869. Pop. 1920, 4,920; 1930, 5,030.

**OCOTILLO** (*Fouquieria splendens*), a spiny shrub of the candlewood family called also coach-whip and vine-cactus. It is found in rocky deserts from western Texas to southeastern California and southward in Mexico, often forming a characteristic feature of the vegetation. The slender, usually unbranched stems, 8 to 25 ft. high, rise in clusters from a common root crown. They bear rigid spreading spines, short fleshy leaves in small rosettes and showy scarlet flowers crowded at the end of the stem.

**OCTAHEDRON**, a solid figure having eight faces. The regular octahedron is one of the five regular polyhedrons. See POLYHEDRON.

**OCTANS** (gen. *Octantis*), the octant, a constellation of exceedingly faint stars directly surrounding the south pole of the heavens. See STAR: map.

**OCTAVE**, in music, the eighth degree of the diatonic scale, bearing the same name as the first degree and forming with it a consonant interval expressed by the ratio 2:1 in both JUST INTONATION and equal TEMPERAMENT. That is, in passing the only interval in which these two systems of tuning agree exactly, save for the identical interval called a unison. Since there are but seven letters in the musical alphabet, it is necessary to repeat these as the names of the notes in different octaves. In order to indicate which octave is intended in the letter system, both capitals and small letters are used, and these are appropriately marked with superior and inferior symbols. The note C is arbitrarily taken as a starting-point, and the letter denoting any particular note bears the same distinguishing mark as the C standing immediately below it, thus:



Authorities differ in their use of capital and small letters, but the terminology used by Herman Helm-

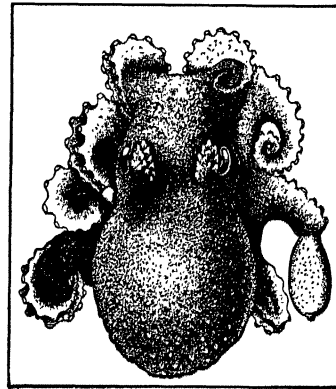
holtz may be taken as a standard in this matter, as shown in the example below:



**OCTAVIUS.** See AUGUSTUS.

**OCTOPUS**, the name of a genus of eight-armed cephalopods (*Octopoda*). There are more than 140 species, found in almost every sea. Though generally frequenting shallow water near the coast, where the bottom is rocky, they have been taken from depths of 11,250 feet.

The octopus, also commonly known as the poulpe or devilfish, has a soft, sac-like body, and its eight arms are provided with two rows of adhesive suckers. It usually crawls about the sea floor on its arms, but occasionally swims backward by forcing jets of water through its funnel. It is carnivorous, and the common octopus (*Octopus vulgaris*), which lives largely on crabs, paralyzes its prey with a poisonous secretion. Several species inhabit American shores. The octopus



OCTOPUS OR DEVILFISH

*Octopus bairdi*. Abundant in rather deep waters, along the North Atlantic north of Cape Cod and also the coasts of Europe

found in the vicinity of New England (*Octopus bairdi*) lives in water from 300 to 600 feet deep, while the species common on the Pacific coast (*Octopus punctatus*) lurks just below the low-water line.

The octopus is eaten by man in many places, particularly near the Mediterranean and in the Far East. Where the native species, as in California, live in shallow water, they can be speared with pointed sticks. Where they inhabit deep water they may be taken by lowering jars to the bottom and leaving them for some time. The animals, taking the jars for good hiding places, creep into them and allow themselves to be drawn to the surface. See also DEVILFISH.

**OCTROI**, an indirect tax levied by the cities of Continental Europe, especially France, during the

Middle Ages. The tax was usually collected at the gates of the cities on goods being brought into them.

**OCULIST**, a specialist in medical practice who examines, treats and prescribes for diseases and injuries of the eyes. The oculist, having first graduated from a school of medicine (*see* MEDICAL EDUCATION), usually is required to have two years of training in ophthalmology before he is competent to practice his specialty. Most schools of medicine now have well-equipped departments of OPHTHALMOLOGY, in which experienced graduate doctors are qualified to treat, either medically or surgically, all diseases of the eyes and all defects of vision. Formerly diseases of the eye, ear, nose and throat were treated by a single specialist. The oculist does not, however, attempt to grind, fit and sell glasses unless there is no reliable optician available. The oculist should not be confused with the optometrist, who measures the power of vision and the adaptation of lenses by purely mechanical means. Optometrists, not being doctors of medicine (*see* DOCTOR, MEDICAL), are forbidden by law to use drugs or to operate on the eyes.

**ODD FELLOWS, INDEPENDENT ORDER OF**, the largest secret society in the United States, next to the Masonic fraternity. Although some writers claim an earlier origin, the majority agree that the order proper began in 1745, in which year the Aristarchus lodge No. 9 met at the Globe Tavern, London. Under the government ban on secret societies the order languished until 1803, when the Grand Lodge of Odd Fellows for England was organized at London. In 1819 the order was established in the United States, where a women's auxiliary, the Daughters of Rebekah, was formed. In 1842 the American order declared itself independent of its parent body, the Manchester Unity, which had organized the Independent Order of Odd Fellows. American headquarters were established at Baltimore, Md. Odd Fellow lodges, recognizing either the British or the American controlling bodies, have been organized in the British Dominion, and throughout Europe. In 1930 the Odd Fellow membership in both branches was numbered at 2,357,088, of which 989,789 were women members of Rebekah lodges. The various lodges organize life benefits, build orphanages, and extend practical aid to members in financial need.

**ODE**, originally the Greek name for a form of stately lyrical verse, more exalted and more impressive than the ordinary LYRIC, which could be chanted to a musical accompaniment. After the simple odes, sung by a single voice, of such poets as SAPPHO, Alcaeus and Anacreon, came the Dorian choral ode in which was introduced the strophe, antistrophe and epode. PINDAR was the greatest Greek writer of odes, and later was followed by CATULLUS and HORACE, who wrote in Latin. The modern ode originated with RONSARD in France and SPENSER in England, the latter being influenced by the *Pléiade*, of which Ronsard was a member. Later writers of odes included Milton, Marvell, Dryden, Gray, and the 19th century poets, Wordsworth, Coleridge, Keats, Shelley, Swin-

burne and, in France, Hugo and Lamartine. One of the outstanding American odes is Lowell's *Commemoration Ode*.

**ODELL, JONATHAN** (1737-1818), American satirist, was born at Newark, N.J., Sept. 26, 1737. He was educated at the College of New Jersey, now Princeton, and became a rector in Burlington, N.J. After writing his famous ode to the king beginning *O'er Britannia's Happy Land*, he was driven from his home, escaping to New York. Odell was an ardent Loyalist. His satires on Congress made him famous, particularly his *Word of Congress*. He died at Fredrickton, N.B., Canada, Nov. 25, 1818.

**ODENSE**, a city in Denmark, situated on the island of Funen, famous as the birthplace of HANS CHRISTIAN ANDERSEN. The house in which the celebrated story-teller was born in 1805 is now used as a memorial museum; in 1930 a great festival marked the 125th anniversary of his birth. Odense, founded early in the history of Denmark, has a cathedral, and the tomb of King Canute the Great, the country's patron saint, who was murdered here in about 1085, as he started for England to dispute its possession with William the Conqueror. Canute was a wise Scandinavian ruler, and his tomb at Odense was made a shrine by medieval pilgrims. The town is now an important port, exporting Danish farm products, and importing yarn, iron, coal, oil and timber. Pop. 1930, 56,737.

**ODER**, a river of Europe, has its source near Olmütz in Czechoslovakia and flows first north and then northwest through Silesia, Brandenburg and Pomerania and reaches the Baltic Sea by three branches, the Dievenov, the Swine and the Peene. The total length of the Oder is about 560 mi. Commercially the Oder is very important, admitting large vessels to Breslau and barges and smaller craft to Ratibor. Besides these two cities, Oppeln, Brieg, Glogau, Kurstin, Stettin and Frankfort-on-Oder are situated on its banks. The principal tributaries are the Warthe, Malpane, Batsch, Bober and Glatzer Niesse. Canals connect the Oder with the Havel and the Vistula rivers.

**ODESSA**, the second largest city and leading port of the Ukraine, or the Ukrainian Region of the R.S.F.S.R. It is situated in the southwest extremity of the Ukrainian S.S.R. on a lofty plateau below which is an open bay of the Black Sea. It is one of the finest cities in the Soviet Union, with a mild, equable climate, regularly laid out, tree-lined streets, handsome buildings and parks. It is a splendid port with five harbors and a lighthouse. The metropolis has an unusual number of educational institutes, theaters, museums and libraries. In the environs are industrial suburbs and health resorts. Its trade turnover is one of the largest of all the Russian ports. The heaviest exports are grain, oil, wool and lumber. Industrial life is prosperous. Odessa has large cork, jute and phosphate factories; other sizable plants produce agricultural machinery, salt, tobacco, sugar, leather and weighing apparatus. There are floating



grain elevators and large ship-repair shops. Odessa is on two regular air lines, one going to Batoum and the other to Moscow. Ukrainians, Poles, Greeks, Great Russians, Armenians, Germans and Jews are the principal races living in Odessa.

The ancient Odessos, a settlement belonging to Greece, gives its name to the present city. Although Odessos is believed to have occupied the same site, all traces of it have disappeared. The site was a commercial port during the Middle Ages, controlled by the Lithuanians. During the 14th century Italian traders carried on an active grain trade here. The port was later conquered by the Tatars and Turks, finally passing into the hands of the Russians in 1789, who changed its name from Khadzhi-bei to Odessa and established a new military and commercial community in 1794. It became an expanding free port, the center of the Novorossia district. Odessa's industrialization began in the second half of the 19th century. Revolts and pogroms marked the year 1905, and the period after the 1917 Revolutions saw prolonged and bitter fighting on the part of Red and White armies and foreign troops. Famine and disease followed which materially reduced the population. Definite Soviet control began in Mar., 1920; in 1923 trade began to revive and by 1926, Odessa had attained normality. Pop. 1926, 420,862. *See also UKRAINE.*

**ODIN**, in Scandinavian mythology, the equivalent of the Teutonic Woden, the chief of the gods, ruled from his palace, Valaskjalf, whence each day he sent out two ravens to bring him news of the world. Ve and Vili were his brothers and with them he created the universe. Frigg was his wife and BALDER a son by her, but he had numerous other wives and children. He was god of wisdom, which he gained from drinking at the fountain of Mimir, and god of war. As such he held his court in Valhalla. His spear was called Gungner and his ring Draupner. Odin is represented as having one eye and riding his eight-footed horse, Sleipnir, followed by two ravens and two wolves. He belonged to the AEsir gods and dwelt at Asgard.

**ODONATA**, the scientific name for an order of carnivorous insects known popularly as dragon-flies. There are over 2,500 species, distributed almost throughout the world. They have large heads, relatively immense eyes, two pairs of membranous wings which differ little in size and shape, and very long flexible abdomens. From the eggs which are laid in the water are hatched aquatic nymphs, which spend a year or more as water-dwellers before they crawl to land for the final molt, in which the perfect insect emerges from the nymphal skin.

**O'DONNELL, CHARLES LEO** (1884- ), American educator, was born at Greenfield, Ind., Nov. 15, 1884. He was graduated from the University of Notre Dame, 1906; studied at Holy Cross College, Harvard University, and the Catholic University of America; and was ordained a priest in the Roman Catholic Church. He became professor of English

literature at Notre Dame in 1910, and in 1928 was elected president of the university. He was appointed provincial of the Congregation of the Holy Cross, 1920, and assistant superior general in 1926.

**ODYLLIC FORCE**, an hypothesis suggested by Baron Reichenbach (1845) to account for the sensitiveness of subjects to emanations from magnets, crystals and metals, and especially to the odyllic light streaming from the fingertips. All these were subjective sensations without possibility of verification, and illustrate how readily even a trained scientist can be misled by the effects of SUGGESTION. *See also AURA.*

**ODYSSEUS**, in Greek mythology, a king of Ithaca, and the hero of the ODYSSEY. He was the son of LAERTES and Anticleia, the husband of PENELOPE and the father of TELEMACHUS. The Romans called him Ulysses or Ulixes. Odysseus was a brave warrior and wise in counsel. He was one of the Greek leaders at



VOTING BETWEEN AJAX AND ODYSSEUS  
Segment of a red-figured kylix (drinking cup) of the 5th century B.C.

the siege of Troy. On the homeward voyage from Troy, Odysseus and his crew met with so many shipwrecks and adventures that they wandered among strange peoples 10 years. At last the hero landed at Ithaca dressed as a beggar, but was recognized by his dog and old nurse. Odysseus disclosed his identity to Telemachus, and eventually rewon Penelope, his wife, by stringing the great bow, which Penelope had set as the feat to be accomplished by her suitors.

**ODYSSEY, THE**, a magnificent Greek epic in 24 books, ascribed to HOMER (written by the end of the 9th century B.C.), a sequel to *The Iliad*. This vast record of the ten years' wanderings of the Greek hero Odysseus, or Ulysses, son of Laertes of Ithaca, may be divided, for convenience, into five sections. Books 1 to 5 constitute a narrative of the love of Odysseus and Calypso on the Isle of Calypso, where the hero, on his return from Troy, has been detained. Here one is told also of Odysseus's wife, Penelope, who is beset by rude suitors in Ithaca, and of their son, Telemachus. Books 5 to 9: the hero, obeying Hermes, who has been sent by the gods, departs from Calypso and, after being wrecked at sea by Poseidon, is brought to the land of the Phaeacians, where he is befriended by Nausicaa, daughter of King Alcinous. In Books 9 to 13 Odysseus recounts to the Phaeacians the tales of his earlier adventures: among the Lotus

Eaters and the Cyclops; of Aeolus, King of the Winds; with the cannibalistic Lystrogonos and the bewitching Circe; among the Cimmerians, when he beheld the ghosts of departed heroes; of his escape from the Sirens and from Scylla and Charybdis; and of his landing, among the shipwreck, at Calypso's isle, at last. Books 13 to 21 tell of the hero's return to Greece, and of how, aided by Athena and disguised as a shepherd, he comes home to Penelope. The last four books treat of the wanderer's victory over his faithful wife's suitors; reunite him with Telemachus and Laertes; and, at last, bring him to a happy truce with his enemies.

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**OEDIPUS**, hero of Greek tragedy, son of Laius, King of Thebes, and of Jocasta, sister of Creon. Having no issue, Laius consulted the oracle and was told that his son, if one should be born, would kill him. Therefore when Jocasta became a mother Laius pierced the feet of the babe, bound them together, and exposed the infant on Mount Cithaeron. Here the child was found by a shepherd who, seeing his swollen feet, called him Oedipus. He was brought up by King Polybus of Corinth and his wife Merope. But Oedipus suffered under the humiliations of a foundling. Consulting the oracle at Delphi as to his parentage, he was told that he would kill his father and marry his mother. Still thinking that Polybus was his father, he refused to go back to Corinth, but happened to meet Laius on the high road. The charioteer of Laius tried to push Oedipus out of the way, and in the scuffle Oedipus killed his real father. In the meantime, the Sphinx had appeared on a rock



OEDIPUS AND THE SPHINX  
From a red-figured amphora, or vase

where she put her famous riddle to every passerby. "What is a being with four feet, two feet, and three feet and only one voice, whose feet vary; and when it has most it is weakest." All who failed to solve the riddle were killed and the Thebans promised Jocasta as a prize to anyone making the right guess. Oedipus said that the being was man and the Sphinx thereupon threw herself from the rock, so perishing. Thus did Oedipus marry his mother and become the father of a daughter, ANTIGONE, with other children. The land fell under a curse which, according to the oracle, would only be removed if the murderer of Laius was expelled from the country. Not suspecting that he was the unwitting criminal, Oedipus consulted the seer Teiresias, who told him the truth. In horror Oedipus put out his own eyes, while Jocasta, also learning the truth, hanged herself. The subsequent accounts are confused, one story being that Oedipus was led into exile by Antigone, another that his sons concealed the disgrace by imprisoning him at Thebes

where he cursed his offspring. These princes undertook to reign alternately but quarreled, killing one another in single combat. Creon issued an edict forbidding their bodies to be buried, but Antigone defied the tyrant by interring her brother, Polyneices. Creon, therefore, had her buried alive in her brother's tomb. The tragedy of Antigone and Oedipus with dramatic variations has been written by AESCHYLUS and SOPHOCLES.

**OEDIPUS TYRANNUS** or **OEDIPUS REX**, a tragedy by SOPHOCLES, dating from the 5th century B.C. The first of a great trilogy and perhaps the finest of all Greek dramas, this play is set at Thebes, where rages a pestilence that can be ended only when King Laius's murder shall be avenged. King Oedipus, doomed hero of numerous Greek tragedies, learns gradually through the seer, Tiresias, that it was he who unwittingly murdered Laius, his father, and that he has taken, also unwittingly, his own mother, Jocasta, in marriage. When this horrible truth is at last made clear, Jocasta kills herself, and Oedipus, after blinding himself, departs from Thebes with his daughter, Antigone.

**OEHLENSCHLAGER**, ADAM GOTTLÖB (1779-1850), Danish poet and dramatist, was born at Frederiksberg, Nov. 14, 1779. His parents were poor, but Edvard Storm, a Norwegian poet who conducted a school, interested himself in the boy and gave him an opportunity to prepare himself for the university. Soon after entering the university Oehlenschläger decided definitely to devote himself to literature. His first work to attract attention was *The Golden Horns*, a poem inspired by two ancient golden drinking horns with runic inscriptions which had been discovered in Slesvig. Aside from its literary merit, this poem is significant as showing the trend of Oehlenschläger's mind toward the myths and legends of the North. The first of his great dramas, *Hakon Jarl*, derives from the same source. Among his other important works are *Aladdin*, or *the Wonderful Lamp*, a dramatic poem; the epic, *Thor's Journey to Jotunheim*; and the dramas, *Palnatoke*, *Aksel and Valborg* and *The Varangians at Miklagard*. He died at Copenhagen, Jan. 20, 1850.

**OELWEIN**, a city in Fayette Co., northeastern Iowa, situated on Otter Creek and Lake Oelwein, 35 mi. northeast of Waterloo. Bus lines and two railroads afford transportation. Oelwein is a market center for the corn, small grain and dairy products of the vicinity. The city has railroad shops, electrical appliance factories and planing mills. August Oelwein settled here in 1873. The city was chartered in 1897. Pop. 1920, 7,455; 1930, 7,794.

**OENONE**, in Greek mythology, daughter of the river god Cebren and wife of PARIS.

**OERSTED**. See MAGNETIC UNITS.

**OFFENBACH**, JACQUES (Levy) (1819-80), German composer of light opera, was born at Offenbach-on-Main, June 21, 1819, the son of a cantor. He began to study the violoncello in Paris in 1833, afterward playing in the Opéra-Comique orchestra, and



in 1848 becoming conductor of the orchestra at the Théâtre-Français. This post directed his interest to the drama. In 1853 his first work, *Pepito*, was produced, and two years later he leased a Paris theater in which he produced a succession of operettas, including his own *Le Papillon*. He produced 89 operettas, which included a number of well-known dramatic sketches set to music by him. The most successful were *La Belle Hélène* and *La Grand Duchesse*. His chief venture into the field of serious music was *The Tales of Hoffmann*, produced a year after his death, at Paris, Oct. 4, 1880.

**OFFENBACH**, the foremost manufacturing city in the German state of Hesse, situated on the Main River and bordering on Frankfort. It manufactures leather, machines, metal goods, chemicals and textiles. The first industries were founded in the 17th and 18th centuries by French emigrants. A plant was built to force compressed air through pipes to factories for motor power. Offenbach has a castle and several churches. It was first mentioned in 970. Pop. 1925, 79,362.

**OFFERTORY**, in the Catholic Church a verse from the Scriptures which begins the second part of the Mass, viz., the first principal part, suitable to the feast or season. The term is frequently used for the **OBLATION**. At High Mass the choir sings the offertory.

**OFFICE APPLIANCES**, equipment used to facilitate office work, have for the most part come into general use during the past 30 years. In general, it may be stated that they should be used when the amount of labor saved by them will show in the payroll or when the job may be done much better by them than it can manually.

Various appliances are employed to improve accuracy, to save time, to eliminate drudgery and unpleasant work, and as in the case of the **TYPEWRITER**, to produce work that cannot be done by hand. Typewriters are, perhaps, the most widely used of all office appliances. Telegraphic typewriters, which transmit messages so that they may be received and produced in typewritten form by a machine at the other end of the wire are used in such offices as newspaper and telegraph and by many industrial and commercial concerns having plants and offices in more than one locality.

Adding and computing machines are used for making additions, subtractions, multiplications and divisions. Bookkeeping machines make postings and strike balances for the bookkeeper. **BILLING MACHINES** make several copies of invoices for goods sold so that they may be used for the sales record, shipping notices, etc., and compute the amounts of the items. **TABULATION MACHINES** sort statistics into classes and accumulate the totals for each group. Coin counters sort mixed coins into denominations. **CASH REGISTERS** make records of all retail sales and accumulate totals. Check writers, signers, endorsers, certifiers and cancellers facilitate the handling of checks. Filing cases and cabinets keep records, correspondence, informa-

tion and the like in an orderly fashion where it may be obtained quickly and where it may be kept safely and permanently. Mechanical filing devices file and locate filed cards with great speed. **DICTATING MACHINES** eliminate the services of a stenographer in taking dictation. Electric paging machines and inter-office telephones save time for the office force. Duplicating machines save much time and labor where several copies of the same material are needed. These include machines duplicating from stencils, from type, from ink impressions on gelatine or clay surfaces, photocopying and blue printing machines, automatic typewriters, addressing machines, autographic registers and typewriters with special carbon paper feed attachments. Stamp affixers, sealing machines and permit mailing machines save much time where large quantities of mail are handled. Where the working time of employees is kept, time recorders are generally used to record the time at which the individuals arrive at work and the time at which they leave. Desks may be mentioned in the office appliance list since they are made in various special types to accommodate particular needs. Numerous small appliances, as paper punches and clippers, rubber stamps and the like, found in nearly every modern office, may also be included. See also **CALCULATING MACHINES**; **DUPLICATING MACHINES**.

**OFFICE ARRANGEMENT**. The modern business office is distinguished by large, open areas with a minimum of sub-divisions in the form of partitions. Arrangement of furniture is controlled by the flow of work which should follow the forward movement principle. Desks face in one direction, with daylight coming over the left shoulder (northern exposure preferable), and are usually spaced two abreast with adequate communicating aisles. Locker and toilet facilities for both sexes are placed at convenient locations on all floors. Underfloor ducts, spaced in harmony with desk arrangement, provide adequate electric service. Orderliness and dispatch, enhanced by mechanization, characterize good office arrangement. See also **OFFICE MANAGEMENT**. H. A. H.

**OFFICE BUILDING**. It has always been the habit of men interested in the same occupation to form themselves into compact groups for convenience. In ancient cities these groups were spread horizontally along the same street, forming trade sections. The need for defense, which restricted the area of the city, and the desire to house the space necessary both for working and living within the same building, produced multi-story structures. When cities grew larger, with a corresponding increase of workers in each trade, it was very natural that these groups, long accustomed to the convenience of working together, would endeavor to further it by imposing a vertical grouping upon the existing horizontal trade section of the city. Under these conditions it seemed evident that convenience in working was more important than the earlier system of living and working in the same place; separate working places, which later developed into office buildings, therefore became inevitable.

Office buildings, commonly supposed to be the result of land speculation within restricted areas, are therefore in addition the result of the same impulse that created the different trade sections in the older cities.

The growth of the multi-story structure, from a relatively low building of three or four stories to the Empire State Building in New York with its 85 stories, is one of steadily increasing convenience and improvement in functional design. The old multi-story building was not limited in height by any human desire, for each age builds its tower of Babel, but because the stairway remained the only method of vertical communication. Naturally that height was limited by the resulting physical fatigue of walking up many flights of stairs and the attendant difficulty of the transportation of materials to higher stories. The intense congestion produced in the city by the growth of the office building and the exaggerated land values that go with it are largely found only where trade convenience forces the necessity. While fundamentally the multi-story building has been developed as a method of creating more space, it has also developed convenience as well as financial gain, especially in a society that is tending to become more cooperative and specialized than financial. The apartment house is thus the natural correlative of the office building.

**Invention of the Elevator.** The office building of the present day, however, would be non-existent were it not for the invention of the elevator about 1850, which at first was used for freight only. In 1869 the first passenger elevator was installed in a building devoted to commercial use, the old Equitable Life Assurance Building at 120 Broadway, of which Gilman and Kendall were the architects and George B. Post the consulting architect. A means had at last been found to obtain building height without the physical discomfort of stairs, and almost immediately buildings were designed to take advantage of the possibilities offered by the elevator. The great improvement in the design of the office building has been aided by a parallel advance in the mechanical and electrical efficiency of the elevator. Improved methods in sanitation, new systems of central heating, electric lighting, and communication through the use of the telephone all added to the usefulness of the office building. They made possible the building of structures of great size and were the reasons for an increasing demand for a new type of structural material, for the limitations of masonry construction were soon exhausted as the necessary thickness of masonry walls at the base of tall buildings shut out light and air and caused a great loss of floor space.

**Steel Construction.** Further height was obtained by the use of cast iron columns and wrought iron girders to relieve the walls of the floor loads. Although many expedients were tried, it was not until the evolution of structural steel shapes, with safety assured by adequate fire protection, that methods and means were found to remove completely the restrictions of masonry construction. This progress was often hindered by building codes, which because of the steady advance

in technological knowledge were frequently antiquated. Now however the use of structural steel is universally accepted and the regulations concerning it are largely standardized.

Skeleton steel construction now offers a method for all building which, for the first time in the history of architecture, is without rigid inflexibilities, a method of great economy in both cost and effort, and for the first time also a method of building which can be engineered on scientific principles and is not dependent upon rule-of-thumb habits.

The entire weight of the structure, walls, floors, occupants, and the necessary services for their comfort, is supported on a steel skeleton composed of cells formed by columns, girders and beams. The loads are transferred downward through the floor construction into columns of increasing strength; and where necessary to take precaution against wind stresses, owing to great height, additional strength is introduced into columns, beams and girders. These are securely fastened together by either the use of rivets or by welding, and completely covered with fireproofing of concrete or other fireproof materials such as precast gypsum. The tendency will be to reduce the water content in all materials so used. The great problems of design, both leading up to and during the course of construction, the use of materials increasingly fabricated under factory conditions and assembled from all parts of the world and brought to the site without interruption, without confusion and only when necessary, attest the splendid management and cooperation of design and labor which have made them possible.

It is apparent that the crowding into relatively small, greatly congested areas, as developed by the office building, has brought with it many evils. The spirit of invention and private enterprise and the search for profits have been as always ahead of the social and political vision of the civic control. The aggravated condition produced by these vertical cities imposed upon a city plan growing haphazardly for horizontal usage, forced cities to realize that planning was necessary and caused them to devise expedients, in no wise fundamental, to alleviate some of these evils. One of these, zoning, through more or less strictly imposed limitations as to height and area, has greatly influenced the appearance of office building design. Devised to protect for the community the use of light and air, the more intelligent regulations tend to control the number of people who may occupy certain areas of land.

The architecture created to meet these new conditions has had an enormous influence upon the high building of every type—even where there are no city ordinances to compel similar requirements. Aesthetically the office building began to have a form and a character of its own independent of the materials which covered the steel skeleton beneath. Materials were used with a new sense of design not dependent upon past traditions. This movement still continues affecting other types of building, and would seem to

be the beginning of a fresh architectural expression which may take its position with the great architecture of the past. It would seem too early to indicate what the aesthetic solution of the skyscraper will be. A great deal of experimentation is taking place, which at present is tending in the direction of simplicity in using materials as a skin covering of the skeleton without much in the way of ornamentation except color in large masses. The development of new materials, of non-corrosive metals, will greatly affect the nature of design. The structure of steel and glass, considered by some the ideal solution, is in question, largely because of climatic conditions. Fundamentally an expression of a cooperative method of living, developing as they have new forms in structure and in design, and fitted for the civilization which produces them, office buildings are the most insistent reason for a more orderly plan of the social community.

R. T. W.

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**OFFICE MANAGEMENT** may be defined as a facilitating activity which is essential to the successful performance of the functions of production, distribution and finance. It usually comprises three major divisions, dealing with (1) the improvement of clerical performance, (2) the development of clerical personnel and (3) the provision of proper working conditions.

Any attempt to achieve improved performance in the clerical field should proceed from a scientific approach and should follow at least four fundamental steps, i.e., analysis, elimination, coördination and standardization.

Analysis should take into account the existing clerical procedures and should result in the accurate compilation and charting of detailed operations and flow of work. Thus, the present status of clerical performance may be visualized and the way paved for inception of the process of improvement.

Elimination should be undertaken in recognition of the general experience that much clerical work currently performed is unnecessary. Accordingly every activity which is not clearly justified as to purpose and value, should be discontinued and this process should be vigorously prosecuted to its ultimate limit.

Coördination involves the integration of simplified procedures and the establishment of logical and well defined organization relationships which will promote balance between operating units and result in the effective dispatch of routine activities.

Standardization implies determination and adoption of the best or most effective method of performance, as well as taking all necessary steps to perpetuate it. Moreover, it signifies, for the time being and until a better method is devised, the final stage of improvement. With changing conditions, however, the process of standardization should be repeated because regular revision is essential to the maintenance of a high level of achievement.

Development of clerical personnel is of chief importance to the attainment of satisfactory operating results. It covers a wide field of activities among which should be emphasized those dealing with selection, placement, training and remuneration. Success in the exploitation of this field is contingent upon the establishment of sound standards based upon carefully devised job specifications (*see* **JOB ANALYSIS**), scientifically determined salary ranges for all typical positions, functionalized employment, organized training and stimulating supervision.

From a fundamental point of view, office management is mainly concerned with proper motivation of the human factor; it accomplishes this usually through the provision of a type of leadership to which clerical employes may be expected to respond loyally and enthusiastically, with increased work accomplishment. Specifically, the task of motivation is centered in supplying adequate financial incentives, adjusting employes to their duties, providing reasonable opportunities for promotion, and appreciating at all times that the personnel problem constitutes a study of human aptitudes.

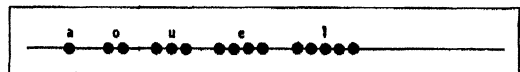
The provision of proper working conditions, which comprises the third major division of office management, is necessitated, apart from any other consideration, by the fact that there is an intimate relationship between clerical productivity and the environment in which clerical activities are performed. Correct illumination, effective ventilation and relatively quiet conditions are the three prime requisites in this connection. These should be supplemented by properly designed office equipment, including desks which will facilitate work performance, chairs which will promote good posture and hence prevent unnecessary fatigue, and filing equipment which will respond to effortless, rapid accurate handling. Effective control of office operations and personnel sums up the objective of office management. *See also* **OFFICE ARRANGEMENT**.

H. A. H.

*See* M. F. Cahill and A. C. Ruggeri, *Office Practice*.

**OFF-SET PRINTING.** *See* **PRINTING**.

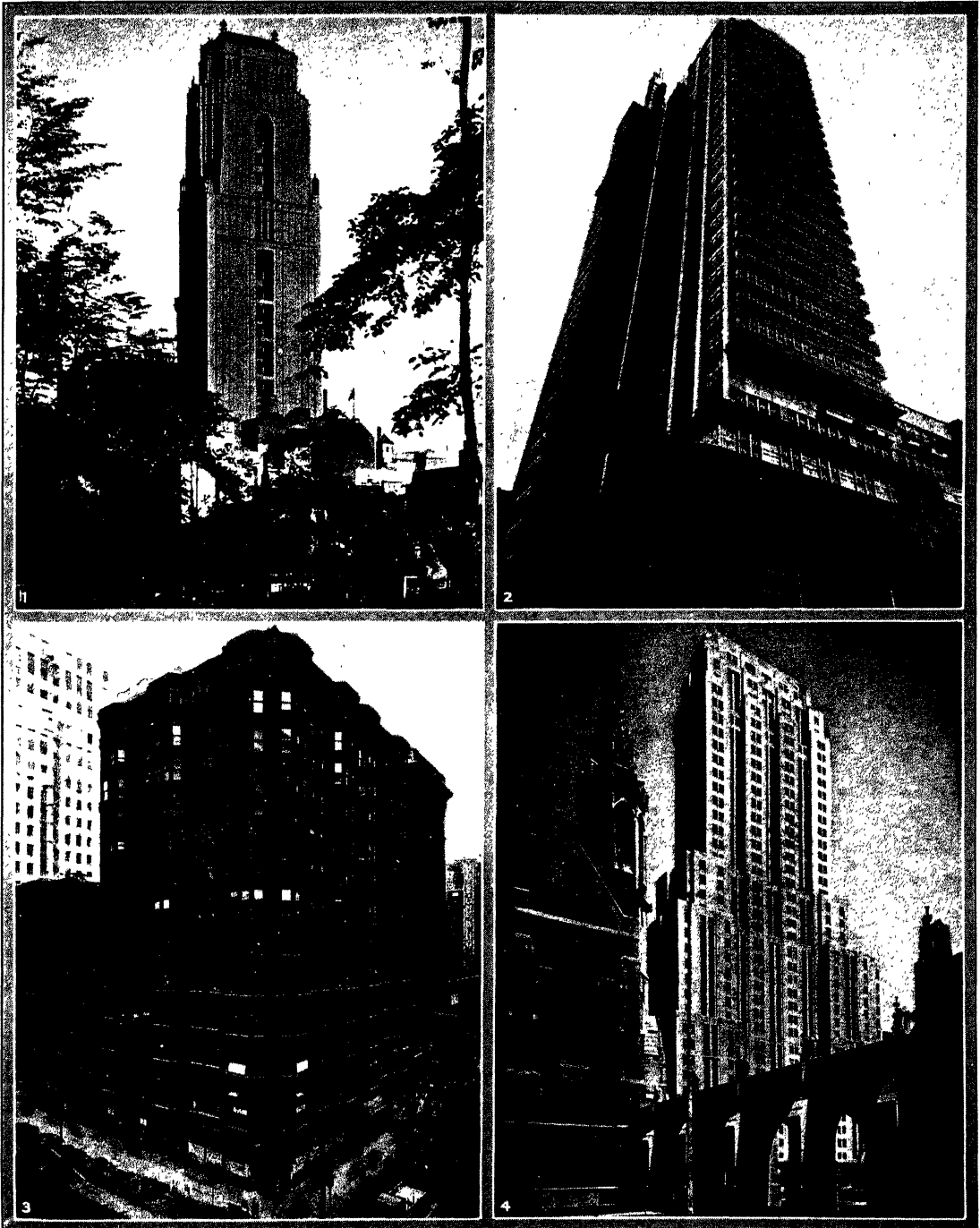
**OGAM**, an archaic alphabet of 20 characters employed by the Celts in Ireland and, to a much less extent, in Britain. It is preserved in some 350 very



VOWEL SYMBOL FOR THE OGAM ALPHABET

brief inscriptions of the 5th and 6th centuries A.D., and is of linguistic importance as giving the earliest known stage of Old Irish. It derives its name from the Celtic god Ogmios, described as the deity of eloquence, and the consonants are indicated by lines on either side of, or crossing, a vertical stem-line, the latter usually formed by an edge of the stone. Thus, a single vertical stroke represents *h*; two, *d*; and three, *t*; while an oblique stroke through the stem-line stands for *m*; two, for *g*; and three, for *ng*, etc. The five

## OFFICE BUILDING



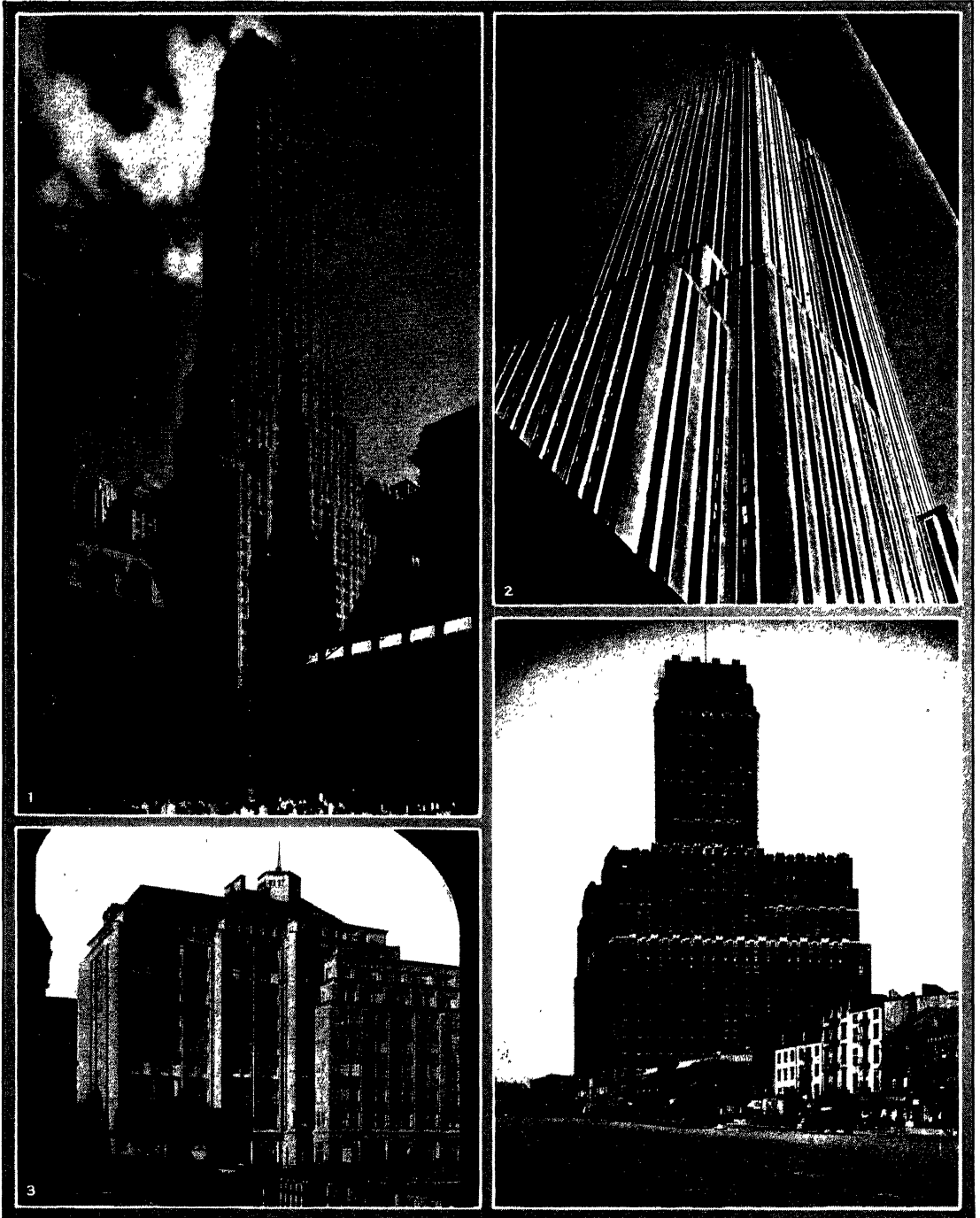
1. EWING GALLOWAY PHOTO; 2. COURTESY HOWE AND LESCAZE, ARCHITECTS; 3, 4. HOLABIRD AND ROOT, ARCHITECTS

### MODERN OFFICE BUILDINGS IN AMERICAN CITIES

1. Bush Terminal Company Building, New York, New York. Corbett, Harrison and MacMurray, Architects. 2. Philadelphia Saving Fund Society Building, Philadelphia, Pennsylvania. Howe and Lescaze, Architects. 3. Tacoma

Building, Chicago, Illinois, the first office building in which a steel skeleton was scientifically used. It was completed in 1889. Holabird and Roche, Architects. 4. Palmolive Building, Chicago, Illinois. Holabird and Root, Architects.

## OFFICE BUILDING



### MODERN ARCHITECTURE IN OFFICE BUILDINGS

1. Irving Trust Company Building, New York, 1931. Voorhees, Gmelin and Walker, Architects. 2. Looking up the side of the new Empire State Building, New York, 1931. Shreve, Lamb and Harmon, Architects. 3. Ballin House,

an 11-story office building at Hamburg, Germany. O. Gerson, Architect. 4. New York Telephone Company Building on West Street, New York City, 1926. McKenzie, Voorhees and Gmelin, Architects.

vowels are denoted by from one to five dots on the line. J. M.

**BIBLIOGRAPHY.**—R. R. Brash, *The Ogam Inscribed Monuments of the Gaedhil in the British Islands*, 1879; R. A. S. Macalister, *Studies in Irish Epigraphy*, 3 vols., 1897-1907, and *The Archaeology of Ireland*, 1928.

**OGBURN, WILLIAM FIELDING** (1886- ), American sociologist and economist, was born at Butler, Ga., June 29, 1886. He obtained his doctorate at Columbia University in 1909, and in 1911-12 served as instructor of economics, politics and history at Princeton University. During 1912-17 he was professor of sociology at the University of Washington, and occupied the same chair at Columbia University during 1919-27. In 1927 he went to the University of Chicago as professor of sociology. He became widely known in the United States for his efforts on behalf of child labor legislation. In 1929 he served as president of the American Sociological Society, and in 1931 as president of the American Statistical Association and director of research of the President's Research Committee on Social Trends. His books include *Progress and Uniformity in Child Labor Legislation*, 1912; *The Social Sciences*, 1927; *American Marriage and Family Relationships*, 1928, and *Industry and Agriculture in Post-War France*, 1929.

**OGDEN, ROLLO** (1856- ), American minister and editor, was born at Sand Lake, N.Y., Jan. 19, 1856. He was educated at Williams College and at Andover and Union Theological seminaries. Ordained to the Presbyterian ministry in 1881, he preached in Cleveland, O., and Mexico City until 1887, when he engaged in literary work in New York City. Ogden was editor of the *New York Evening Post* from 1903-20, and in 1922 was made editor of the *New York Times*.

**OGDEN**, a city in northern Utah, the county seat of Weber Co., and the second largest city in the state, situated several miles east of Great Salt Lake, 37 mi. north of Salt Lake City. Ogden is a railroad center served by seven lines, and is a shipping point for sugar beets, fruits and farm products. The city has beet-sugar and clothing factories and various food products plants. In 1929 the manufactures amounted approximately to \$19,000,000; the retail trade reached a total of \$26,494,886. Ogden is the seat of Weber Junior College, Utah State Industrial School and the State School for the Deaf and Blind. Little Mountain, Artesian Park, Ogden Canyon, the Wasatch Mountains, Cache National Park, and several mineral springs are interesting features of the vicinity. The Mormons settled here in 1848; Brigham Young planned the city in 1850. Ogden was incorporated in 1861. Pop. 1920, 32,804; 1930, 40,272.

**OGDENSBURG**, a port city in St. Lawrence Co., northeastern New York, situated on the St. Lawrence River at the mouth of the Oswegatchie River, 55 mi. northeast of Watertown. Lake and river craft, bus lines and two railroads afford transportation. Ferries connect Ogdensburg with Canada. There is an airport. The city has a good harbor which is an impor-

tant shipping point. The principal manufactures are paper, silk, brass products, clothing and textiles. The industrial output, 1929, was valued at \$9,490,210. The retail business in 1929 amounted to \$7,772,135. The Remington Art Memorial has a large collection of pictures and sculptures of Frederic Remington, who was born in this county, also Indian relics. Ogdensburg is the seat of a State Hospital for the Insane and a State Armory. A colony was founded here in the middle of the 18th century by Father Picquet, a missionary to the Indians. Ogdensburg was incorporated in 1847. Pop. 1920, 14,609; 1930, 16,915.

**OGIER THE DANE**, a legendary hero in various *chansons de geste* of the Charlemagne cycle. A favorite paladin of Charlemagne, his youth is restored by Morgan le Fay and he frees France from pagan invaders. He appears in Morris's *Earthly Paradise*, 1870, and in Ariosto's *Orlando Furioso*, 1516.

**OGILBY, REMSEN BRINCKERHOFF** (1881- ), American educator, was born in New Brunswick, N.J., Apr. 8, 1881. He graduated in 1902 at Harvard where he later studied theology, and was ordained by the Protestant Episcopal Church. From 1907-09 he served as curate of St. Stephen's Church, Boston, and during the nine succeeding years was headmaster of Baguio School in the Philippine Islands. After serving as chaplain in the United States Army in 1918-19 he became in the latter year master of St. Paul's School at Concord, N.H. Ogilby resigned in 1920 to become president of Trinity College, Hartford, Conn.

**OGLALA**, the most important group of the Teton division of the DAKOTA, a North American Indian tribe of the Siouan stock.

**OGLETHORPE, JAMES EDWARD** (1696-1785), English soldier and colonial governor, was born at London on Dec. 21, 1696. He began studies at Corpus Christi College, Oxford, which he left to enlist in the campaign of Prince Eugene against the Turks in 1716-17. He returned to England in 1722 and was sent to Parliament, where he proposed relieving the grave abuses of debtors' prisons. He was, therefore, appointed chairman of a committee to investigate the situation, and planned a colony for debtors' relief. Liberal contributions, an appropriation of £10,000 from Parliament, and a grant of land from George II made a colonizing expedition possible. In 1732 he arrived at Charleston with 120 men. He founded Savannah, and for 10 years was governor of the colony of Georgia, which he protected against the invasions of the Spaniards and Indians. He returned to England in 1743, served against the Stuart invaders, and in 1765 was made commander of the king's forces. He died at Cranham Hall, Essex, on July 1, 1785.

**O'GRADY, STANDISH JAMES** (1846-1928), Irish author, was born at Castletown, County Cork, Sept. 18, 1846. He was educated at the University of Dublin, and became one of the inaugurators of the Celtic revival. Among his published works are

*History of Ireland: The Heroic Period, 1878, Finn and his Companions, 1892, Ulrick the Ready, The Bog of Stars, 1893, The Coming of Cuculain, and The Passing of Cuculain.* O'Grady left unfinished his *History of Ireland, Critical and Philosophical*, when he died at Shanklin, Isle of Wight, May 18, 1928.

**O'HARA, THEODORE** (1820-67), American poet and soldier, was born at Danville, Ky., Feb. 11, 1820. He served in the Mexican War, being brevetted major for gallantry, and in the Civil War was colonel of an Alabama regiment. O'Hara is author of the famous poem, *Bivouac of the Dead*. He died near Guerryton, Ala., June 6, 1867.

**O. HENRY.** See PORTER, WILLIAM SYDNEY.

**O'HIGGINS, BERNARDO** (1776-1842), Chilean soldier and dictator, was born at Chillán, Aug. 20, 1776. He was sent to schools in England and Spain and returned to Chile in 1802. He joined the Chilean revolutionists in 1810, and three years later became commander of the patriot forces. In 1814 a Spanish army defeated the Nationalist forces at Rancagua. The leaders, including O'Higgins, fled to Mendoza. Three years later he became a lieutenant in San Martín's expedition, and led the charge, at Chacabuco, Feb. 12, 1817, which won the battle, and gained independence for Chile. O'Higgins became dictator, but five years later was deposed, and retired to Lima, Peru, where he died Oct. 24, 1842.

**OHIO**, one of the north central states of the United States, popularly called the "Buckeye State." It is situated between 38° 27' and 41° 57' N. lat. and 80° 34' and 84° 49' W. long.



OHIO STATE SEAL

On the north the state is bounded by Michigan and Lake Erie; on the east by Pennsylvania and West Virginia, from which it is separated in part by the Ohio River; on the south by West Virginia and Kentucky, from which it is separated by the Ohio River, and on the west by Indiana. Ohio comprises an area of 41,040 sq. mi., inclusive of 300 sq. mi.

of water surface, with an extreme length of 222 mi. from east to west and an extreme breadth of 210 mi. from north to south. In size Ohio ranks thirty-fifth among the states of the Union.

**Surface Features.** Ohio is a comparatively level plain with a mean elevation of 850 ft. above sea level. Its relief varies from 425 ft. on the surface of the Ohio River in Hamilton Co., to 1,550 ft. on Campbell Hill in Logan Co. Topographically the eastern part belongs to the Allegheny plateau and the western half to the central lowlands or prairie plains. These two regions merge without creating any distinct line of contact. The features which relieve their plain surface are, chiefly, the bluffs along the Ohio River, the terminal moraines deposited by the retreating ice sheet, and the wide, shallow river valleys.

A line drawn from the northeastern corner to the middle western boundary defines roughly the watershed separating the streams which flow northward to Lake Erie and those which are tributary to the Ohio. The latter include the Miami, Scioto, Hocking, Mahoning and Muskingum. Along the lake shore is a flat, sandy belt called the lake plain. It was covered by water when the lake had a higher level, and the former shore is marked by ridges of sand.

**Climate.** Although marked by great changes between summer and winter, due to its interior position, climatic conditions are fairly uniform throughout the state. The mean annual temperature for the state is 51.1° F. At Columbus the average for January is 28.6° F. and for July, 74.9° F. During the period, 1883-1930, the highest temperature recorded in Ohio was 113° F. and the lowest, -39° F. The average annual precipitation is 38 in., including 29.6 in. of snow. At Columbus the average date of the last killing frost in spring is April 17 and that of the first killing frost in autumn is October 18, giving an average growing season of 184 days or almost exactly equal to that of central Missouri and Kansas.

**Forests and Parks.** With the exception of a small prairie region in the northeastern part, Ohio was originally covered with one of the finest hard wood forests in the country. First-growth timber has been almost entirely cut over, but extensive sections of the hill regions are covered with splendid second-growth forests. The principal deciduous trees are oaks, hickories, chestnut, elm, basswood, birch and black gum. Sugar maples and beech are found on the lower slopes of the ravines. Among the conifers are scrub, pitch, white and short-leaf pine, red cedar, arbor vitae, yew and hemlock. On the Allegheny plateau are mixed conifer and deciduous forests. The Till Plains region is characterized by an almost complete absence of conifers, except red cedar. The regions bordering the shores of Lake Erie have beech-maple forests on the beach ridges. Enormous tracts of swamp forests and open oak forests originally covered northwestern Ohio which was once part of the bed of Lake Erie. Ohio cooperates with the Federal Government under the Clarke-McNary Law and in 1930, 2,643,392 trees were distributed for forest planting on state and private lands. Five distinct classes of areas preserve scenic, historic and forest lands and also provide refuge for wild life. A well-developed system of state forests, with a total area of 39,848 acres in 1929 and state forest parks of 3,623 acres are administered by the State Forestry Department. Many of these have camp sites and other recreational facilities. Six lakes constructed between 1827 and 1844 in connection with a now abandoned canal system have been made into state parks. They are LAKE ST. MARY'S, 15,500 acres; Indian Lake, 6,300 acres; Lake Loramie, Buckeye Lake, 4,000 acres; Portage Lakes, 2,500 acres; and Guilford Lake, 5,000 acres. Except for a narrow marginal strip the lands surrounding these lakes are privately owned and have been devoted to summer cottages, hotels, club houses,

and amusement resorts. The Ohio State Archeological and Historical Society, incorporated in 1885, administers 16 small parks. Of these Mound City Park contains an important prehistoric mound group; Fort Ancient is probably the greatest prehistoric defensive earthwork in the world; Serpent Mound Park contains an earthwork with a huge serpent about 1,335 ft. long and from 5 to 20 ft. wide coiling along the crest of a high ridge which has been pronounced the greatest effigy earthwork on the North American continent, if not in the world; Fort Laurens is the site of the first fort built by white soldiers in the state of Ohio and the Battlefield of Fallen Timbers Park is the site of the battle where General Anthony Wayne defeated the Indians on Aug. 20, 1794. Roosevelt Preserve in Scioto Co. is an 8,600-acre region containing a large pheasant farm and a zoo.

**Minerals and Mining.** The mineral resources of Ohio are extensive and widely distributed. Of major importance are the immense deposits in the eastern counties of fire clay used in making pottery, brick and tile. Next in value are the coal fields covering an area of about 10,000 sq. mi. in the southeast. Important petroleum and natural gas fields are found across the northern half of the state. There are large deposits of excellent limestone and sandstone, and also sand, gravel, gypsum and salt beds and various minor minerals.

With mineral productions in 1929 amounting to \$220,061,343, Ohio stood sixth among the states, ranking first in clay products and lime, third in sand and gravel and limestone, fourth in salt, sixth in coal and tenth in petroleum. Of chief importance were clay products valued at \$81,797,495. Other leading products in order of value were coal, 23,689,477 tons, \$35,733,000; natural gas, 57,936,000 M cu. ft., \$32,890,000; petroleum, 6,743,000 bbls., \$15,770,000; stone, 14,771,030 tons, \$14,957,234, including limestone, \$12,091,055, and sandstone, \$1,186,128; cement, 9,144,085 bbls., \$13,427,778; sand and gravel, 14,250,141 tons, \$9,182,862; lime, 962,415 tons, \$7,935,656; gypsum, 374,008 tons, \$3,301,440; and salt, 1,449,360 tons, \$3,199,903. Among minor products were natural gasoline, abrasive materials as grindstones and pulpstones, and bromine. During 1929 864 mines and quarries gave employment to 28,846 persons, who received \$34,541,766 in salaries and wages; of these 22,868 were engaged in coal mining.

**Soil.** In northern and western Ohio, the soil is composed largely of glacial drift and belongs to the great agricultural district of the upper Mississippi valley. The richest crop land is found in the valleys of the Great and Little Miami rivers where alluvial deposits overlie a clay subsoil. While there are sandy areas near the mouth of the Maumee River, the predominating drift formation throughout Ohio is that of clay. In southeastern Ohio the soil, derived from the decomposition of underlying rock formations, is not so favorable for agriculture as that of the rest of the state, but in east central Ohio the soil contains much lime and is therefore highly productive.

**Agriculture.** In value of farm products Ohio ranks usually among the 12 leading states. The principal crops are corn, hay, oats, wheat and vegetables.

In 1930 21,514,059 ac. or 82.5% of the entire land area was in farms, 219,296 in number, with an average size per farm of 98.1 ac. and an average value per acre of \$78.69. Of the farm area 11,269,395 ac. or 52% was crop land; 8,037,544 ac. or 37%, pasture land; and 919,926 ac. or woodland. The total value of farm property was \$2,012,936,814, of which \$1,693,030,716 was represented by land and buildings; \$103,175,957, by implements and machinery; and \$216,730,141, by domestic animals.

According to the census of 1930 Ohio produced in 1929 field crops to the value of \$232,768,211, ranking eleventh among the states. It stood third in buckwheat, seventh in corn, eighth in oats, ninth in wheat and tobacco and tenth in hay and sugar beets; it also ranked fifth in grapes and seventh in raspberries. In vegetables harvested for sale the state stood seventh, ranking fifth in sweet corn and celery, seventh in cabbages, eighth in onions, and tenth in potatoes and tomatoes. The chief crops were grains, \$138,383,738; hay and forage, 3,456,552 tons, \$41,915,156, chiefly timothy and clover 2,948,855 tons; vegetables, \$35,787,138; fruits, \$8,490,271; tobacco, 39,828,515 lbs. grown on 49,575 ac., \$6,452,219, and sugar beets, 158,263 tons, \$1,194,886.

The leading grains were corn, oats and wheat. Of 3,473,143 ac. devoted to corn, 2,911,424 ac. harvested for grain produced 102,177,194 bu., and 180,011 ac. cut for silage yielded 1,378,964 tons. Oats were grown on 1,542,574 ac. with a yield of 44,730,590 bu., and wheat on 1,563,740 ac., 30,289,579 bu. Other grain crops were barley, 1,978,779 bu.; rye, 635,302 bu., and buckwheat, 484,221 bu.

Potatoes, grown on 104,490 ac. with a yield of 10,031,954 bu., were valued at \$15,549,529. Other important vegetables included tomatoes \$2,290,711, sweet corn \$1,593,484, celery \$996,473, cabbages \$942,423, onions \$926,503 and beans \$532,160. The chief fruits were apples 2,540,504 bu., peaches 478,395 bu., pears 203,558 bu., grapes 28,242,818 lbs., strawberries 5,870,904 qts. and raspberries 2,690,023 qts.

Farm products sold by cooperative marketing rose from \$18,762,020 in 1919 to \$26,102,644 in 1929 and farm supplies purchased by this method from \$3,197,047 to \$6,167,597. Farm machinery and equipment in 1930 included 201,552 automobiles, 39,210 motor trucks, 52,974 tractors, 21,278 electric motors and 52,508 stationary gas engines.

**Animal Industry.** Dairying, hog-raising, poultry growing and sheep-raising are important animal industries. According to the census of 1930, the rank of Ohio among the states was seventh in swine, and eighth in milk cows and sheep on farms; sixth in chickens raised; sixth in chicken eggs, seventh in milk, and eighth in wool produced; also eighth in dairy products sold. The state stood tenth in total value, \$216,730,141, of domestic animals. Among these were 1,772,856 cattle reported from 191,560



farms or 88% of all farms in the state and valued at \$101,509,037; horses, 494,947 in number valued at \$50,509,931; mules, 31,356, \$3,290,866; swine, 2,777,938, \$28,793,623, and sheep, 2,535,664, \$15,847,147.

Of the cows on farms, 960,694 were kept mainly for milk production and 61,081 mainly for beef production. In 1929 454,116,752 gals. of milk were produced; the total value of dairy products marketed was \$74,683,719, including \$50,416,209 for whole milk sold. The value of all poultry raised was \$32,848,764. The number and value of the chief kinds were chickens, 32,574,582, \$31,335,206; turkeys, 177,322, \$624,691; ducks, 541,679, \$572,440, and geese 169,837, \$316,427. The chickens sold, 16,399,709 in number, were valued at \$16,247,642. Of 135,990,334 doz. chicken eggs produced, valued at \$43,149,325, 109,023,910 doz., with a value of \$34,570,878, were marketed. The sheep industry yielded 14,657,419 lbs. of wool valued at \$4,956,111. Honey, amounting to 3,322,775 lbs. valued at \$594,841, was produced from 114,806 hives.

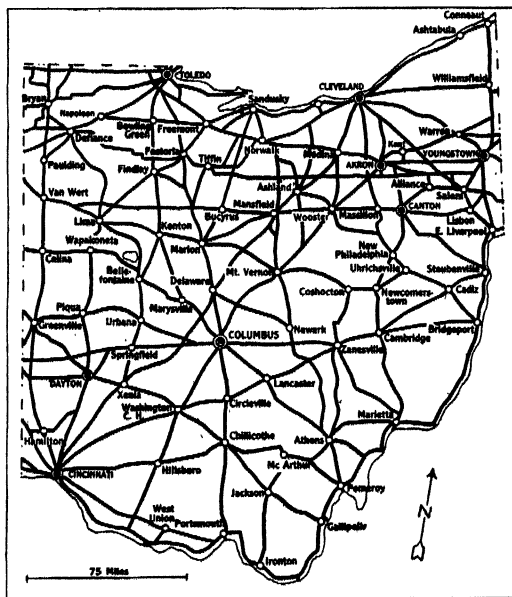
**Fisheries.** The commercial fisheries of the state are all in Lake Erie or on the Ohio River, and the total catch in 1930 amounted to 17,194,000 lbs., valued at \$1,040,000. Mussel shells make up most of the Ohio River take, while lake trout, perch, whitefish and lake herring are the principal lake species.

The state issued 90,000 fishing licenses in 1930 and received \$92,123 in fees. In 1930 fifteen fish hatcheries were operated by 50 men at a cost of \$109,662. The output included 181,400 bass, 1,174,604 other game fish and 190,000,000 commercial species. In 1930, the U.S. Bureau of Fisheries planted in Ohio waters 2,600,000 carp, 62,940,000 whitefish, 108,000,000 pike perch, 1,125,625 yellow perch, 70,000 brook trout and 52,000 other game fish.

**Transportation.** Ohio enjoys excellent transportation facilities, both by land and water routes. The first improved waterway, authorized by the state in 1825, was a canal which started at Portsmouth on the Ohio River, followed the Scioto River to about the center of the state, and then took a northeastward course from Akron to Cleveland. This was completed in 1830. A year later another canal was opened from Cincinnati to Toledo, along the courses of the Miami and the Maumee rivers. The Ohio River and its tributary the Muskingum afford communication with Pennsylvania and the Mississippi valley states. The ports of Cleveland, Ashtabula, Toledo, Sandusky and Conneaut, on Lake Erie, have developed a heavy volume of foreign trade, via the Great Lakes waterway, as well as water and rail communication with New York City. A fine system of intersecting steam railways has been developed. In 1930 the total railway mileage was 8,810, with the New York Central, the New York, Chicago and St. Louis, the Pennsylvania, the Baltimore and Ohio and the Wheeling and Lake Erie the most important lines.

The state's highway system has shown steady improvement and extension. There were 133,056 mi. of highways on Jan. 1, 1930, including 48,503 mi. of

surfaced roads and 10,851 mi. of improved state highways. During 1929, highway expenditures were \$70,585,860, of which \$30,281,207 was paid by the state and \$40,304,653 by county and local governments.



OHIO STATE ROADS

Gasoline consumption during 1930 aggregated 975,582,000 gals. The state gasoline tax produced an income of \$37,081,451 that year as against \$13,257,266 in 1926. Motor vehicle registrations in 1930 were 1,759,363 compared with 1,346,400 in 1925. The growth of trucking transportation facilities is indicated by the registrations, which went from 167,000 in 1925 to 204,270 in 1930. During the same period, buses in operation increased from 3,930 to 4,882.

**Manufactures.** Ohio is one of the foremost manufacturing states. Early in its history it established substantial manufacturing industries based on its rich mineral and agricultural resources. Prior to 1820 flour and packed meats were shipped from Ohio by water to southern markets. Since 1900 there has been very rapid expansion in factory industries. During the 30-year period 1899-1929 the state's manufactures increased in value 700%. To a large extent this increase was due to the remarkable growth of the iron and steel, motor-vehicle and rubber-tire industries, which produce about half of the total output. Important factors in this development have been the state's advantageous position for marketing its products, abundant supplies of raw materials and fuel, and unsurpassed transportation facilities by lake, river and rail.

According to the Census of 1930 Ohio with manufactures for 1929 valued at \$6,027,903,137 stood fourth among the states. Its 11,855 establishments gave employment to 112,242 officers and employees, who re-

ceived \$302,013,905 in salaries, and to 741,143 wage earners, who were paid \$1,102,166,499 in wages. These factories used a total of 4,340,575 horse power, expended \$225,723,721 for fuel and power, and \$2,912,375,113 for materials and supplies, and added by the process of manufacture \$2,889,804,303 to the value of their output.

In this highly diversified output there were 196 separately enumerated groups of manufactures. The state ranked first in the production of rubber tires, machine tools, stoves, pumps, pottery, and foundry and machine shop products. It stood second in iron and steel, motor vehicles, motor vehicle bodies and parts, envelopes and coke, and third in glass, gas and electric fixtures, book and job printing and publishing, and steam railway car shop construction. Among the products in which Ohio ranked fourth were men's clothing, steam fittings, engines, ice cream, perfumery, paints and varnishes, paper boxes, bread and bakery products, coffee roasting, and printing and publishing newspapers and periodicals. The state stood fifth in butter, electrical machinery, confectionery, furniture and planing mill products, and sixth in women's clothing, condensed milk, paper, fertilizers, prepared feeds, hardware, manufactured ice and wooden boxes. It ranked seventh in boots and shoes and patent medicines; eighth in flour, packed meats, beverages and shipbuilding, and tenth in petroleum refining.

The leading manufactures, which included 65% of the output of the state, in order of value were:

Industry or Product	No. Persons Employed	Value of Products \$
Iron and steel rolling mill products	95,584	817,823,034
Rubber tires	63,207	503,197,194
Foundry and ma	72,686	398,471,144
Motor vehicles	32,131	387,355,225
Electrical machinery	43,223	264,359,741
Motor vehicle bodie	31,820	233,080,771
Pig iron	6,481	175,084,126
Meat packing	7,195	163,155,787
Printing and publ ung, newspapers and periodicals	19,295	132,386,949
Bread and bakery products	14,768	103,235,031
Steam railway car shop construction	28,074	86,980,386
Paper	10,250	80,558,443
Structural and ornamental iron and steel	9,957	74,245,979
Printing and publishing, book and job	13,014	68,999,908
Men's clothing	14,490	68,788,120
Petroleum refining	2,889	68,470,077
Machine tools	13,895	67,558,553
Paints and varnishes	4,760	63,686,060
Coke	3,375	61,884,849
Furniture	12,744	60,576,681
Stoves and ranges	11,007	52,031,706
Boots and shoes	13,358	51,013,079

The principal manufacturing centers, which produced four-fifths of the entire manufactures of the state, were Cleveland, \$1,241,083,844; Akron, \$544,581,694; Cincinnati, \$522,096,853; Toledo, \$420,824,352; Dayton, \$316,525,931; Youngstown, \$264,787,959; Columbus, \$212,227,751; Canton, \$153,975,413; Norwood, \$118,076,404, and Springfield, \$110,223,105.

**Commerce.** According to the census of 1930, there were in 1929 8,078 wholesaling establishments in Ohio, with total sales of \$3,094,444,580. This volume represented 4.45% of the total for the United States, and was exceeded in only five states. The wholesalers gave full-time employment to 84,766 men and women whose annual salaries and wages aggregated \$154,690,581. Cleveland, the chief wholesaling center, reported sales of \$1,175,022,279, while Cincinnati reported \$735,711,506. Columbus, Dayton, Akron, Youngstown, Toledo and Canton were also important.

The total sales of the 84,042 retail stores amounted to \$3,056,748,364. This retail volume was surpassed only in New York, Pennsylvania, Illinois and California. Sales per store averaged \$36,372; sales per capita were \$459.89.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Food	28,055	\$790,395,425	25.85
Automotive	15,167	600,092,635	19.63
General Mdsc.	5,692	449,111,184	14.70
Apparel	6,370	307,712,833	10.05
Lumber & Bldg.		216,471,956	7.08
Furn. & Household		137,976,160	4.52
All other stores		554,988,171	18.17
Total, all stores	84,042	\$3,056,748,364	100.00

Cleveland, the principal port, handled water-borne traffic amounting to 16,858,712 tons, with a value of \$242,771,085. Cincinnati, which handled 21,955,148 tons of Ohio River traffic with a value of \$192,308,473, was also important.

**Finance and Banking.** The assessed value of all taxable property in Ohio in 1929 was \$13,677,716,020. However, on Dec. 31, 1930, its bonded debt was only \$5,000,000, represented by soldiers' bonus bonds. In 1930 the total state revenue was \$88,333,100; total disbursements were \$82,837,457. The chief sources of income were general revenue, \$40,948,944 and gasoline taxes, \$33,524,048. The principal payments were for highway expenditures, \$24,715,375, educational equalization, \$4,279,278, World War compensation, \$2,975,000 and general departmental overhead.

The first bank in Ohio was chartered in 1803. The legislature created five more by 1813. These banks did an excellent business, and when a branch of the first United States bank was established in Cincinnati, it met with strong local opposition. The state's attempts at special taxation of the new bank were defeated in the U.S. Supreme Court. However, in 1836, the state legislature passed a special act, prohibiting the establishment of a branch of the second United States Bank in Ohio. The issuance of large quantities of paper currency by unauthorized banking institutions forced the passage of a free banking law in 1851. National banking became popular during the Civil War, and retained its ascendancy until early in the 20th century. The liberal charter provisions available to trust companies and state banks then restored them to their former popularity. In 1930, there were 988 banks in Ohio. Of these, 300 were national banks,

636 state banks and trust companies and 52 private banks. The total capital of these institutions was \$192,063,350; their surplus and undivided profits aggregated \$208,447,000. Total resources of all banks amounted to \$3,394,085,000, with loans and discounts, including rediscounts aggregating \$2,033,157,000. Total demand deposits were \$1,080,526,000; time deposits, including postal savings, aggregated \$1,543,087,000. Per capita time and demand deposits were \$393.76; per capita savings deposits, \$221.62. The total national bank circulation was \$34,619,000. Bank clearings for year ended Sept. 30, 1930 were \$7,098,600,000 in Cleveland and \$3,400,300,000 in Cincinnati.

**Government.** The legislative body consists of a Senate composed of 36 members and a House of Representatives of 128 members, all elected for terms of two years and meeting in biennial sessions unlimited in duration. The chief executive is the governor, elected for a term of two years at a salary of \$10,000 per year. Other executive officers are the lieutenant governor, secretary of state, auditor, treasurer, and attorney-general. Judicial power is vested in a supreme court, courts of appeal, courts of common pleas, and courts of probate. The supreme court consists of 7 judges elected for terms of six years at salaries of \$6,500 per annum.

**Social Welfare Institutions.** The Department of Public Welfare controls the state institutions of this character. There is an industrial school for boys at Lancaster and for girls at Delaware, schools for the blind and deaf and an institute for feeble-minded at Columbus. There is also a feeble-minded institute at Orient. A hospital for criminal insane is at Lima and for other insane there are hospitals at Athens, Cleveland, Columbus, Dayton, Cincinnati, Toledo and Massillon. A hospital for epileptics is located at Gallipolis and a tuberculosis sanatorium at Mt. Vernon. At Sandusky is a soldiers' and sailors' home. The Madison Home is at Madison. There is a prison farm at London, a reformatory at Mansfield and a reformatory for women at Marysville. The penitentiary is at Columbus.

**Education.** The first school was established at Marietta in 1788. The University at Athens was created by the state legislature in 1802, and academies at Chillicothe and Dayton were incorporated in 1808. The first public school law was enacted in 1821. There were 8,436 public school buildings in the state in 1928, with 1,052,665 pupils in the public kindergartens and elementary schools, and 243,023 pupils in the public secondary schools. Children 6 to 18 years of age are required to attend school the full term.

The number of persons from 5 to 20 years of age attending school in 1930 was 1,435,431, or 73.9% of the population within the ages specified, as compared with 1,095,577, or 67.8%, in 1920. The number of persons, 10 years of age and over, unable to read and write in 1930 was 123,804, or 2.3%, as compared with 131,006, or 2.8%, in 1920. Foreign-born white illiterates numbered 74,131, or 11.6%, in 1930, and 84,387, or 12.6%, in 1920.

There are 40 institutions of higher learning in Ohio. Among those maintained by the state are Ohio University at Athens, Miami University at Oxford, Ohio State University at Columbus, and normal colleges at Bowling Green and Kent. Colleges and universities not controlled by the state include the municipal universities at Akron, Cincinnati, Toledo, Cleveland, and Dayton; Western Reserve University at Cleveland; Oberlin College at Oberlin; Ohio Wesleyan University at Delaware; Denison University at Granville; and for Negroes, Wilberforce University at Wilberforce. The Ohio State Library Board has its headquarters at the State Library at Columbus.

**Population.** In 1930 Ohio ranked fourth among the states with a population of 6,646,697 or an average of 163.1 per sq. mi., an increase of 887,303 or 15.4% over 1920. The population rose from 230,760 in 1810 to 1,980,329 in 1850, 4,157,545 in 1900, 4,767,121 in 1910, and 5,759,394 in 1920. In 1930 there were 6,331,136 or 95.3% whites and 309,304 or 4.7% Negroes, an increase from 1920 of 13.6% whites and 66.1% Negroes. Of the whites 5,686,985 were native-born and 644,151 were foreign-born, a decrease in the latter of 34,546 from 1920. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 508,914 or 25.4% were German; 184,698 or 9.2%, Czechoslovakian; 180,452 or 9.0%, Italian; 175,608 or 8.8%, Polish; 136,330 or 6.8%, English. The urban population was 4,507,371 or 67.8% of the total, an increase of 830,235 or 22.6% from 1920; the rural population was 2,139,326 or 32.2% of the total, an increase of 57,068 or 2.7% since 1920. There were in 1930 six cities of 200,000 and upwards: Cleveland, 900,429; Cincinnati, 451,160; Toledo, 290,718; Columbus, 290,564; Akron, 255,040; Dayton, 200,982.

**Occupations.** In 1930, 2,615,764 persons, or 39.4% of the population, were gainful workers 10 years old or older; 79.4% of these were males and 20.6% were females; 80.7% were native white; 13.6% foreign-born white, and 5.6% Negro. Of the females 15 years old or older, 55.2% were single, 28.3% were married and 16.5% were widowed or divorced.

Among the principal occupations, with number of workers, were factory operatives and laborers, 370,678 men and 83,417 women; farmers, 201,155, and farm wage workers, 90,039; clerks, 86,788 men and 47,511 women; salespersons, 92,181 men and 38,891 women; servants, 13,800 men and 79,533 women; retail dealers, 89,820; building laborers, 62,675; machinists, 60,238; chauffeurs, 59,189; school teachers, 11,329 men and 42,190 women; carpenters, 51,526; stenographers, 1,923 men and 46,025 women; bookkeepers and cashiers, 13,641 men and 29,277 women; painters, glaziers and varnishers, 27,570; mechanics, 33,473; barbers and hairdressers, 14,731 men and 7,230 women; waiters, 7,167 men and 13,559 women, and real estate agents, 11,509.

## HISTORY

Within a generation after LA SALLE visited Ohio, trading expeditions were sent into the region from Albany. A battle-ground and hunting field of many

tribes, but the permanent habitation of possibly none except the Erie, Ohio was comparatively neglected in the exploitation of the old Northwest by French and English traders. But as the focal point of antagonistic trends of occupation, Ohio was highly important. Celeron de Bienville took formal possession for France in 1749, the year in which the OHIO COMPANY was



COURTESY C. OF C. MARIETTA, O.

THE OHIO COMPANY'S FIRST LAND OFFICE

chartered by George II of England. The FRENCH AND INDIAN WAR ended in the extinction of the French claims. But PONTIAC'S CONSPIRACY followed, and the region was not quieted until 1765. Pickawillany, founded in 1749 on the Great Miami, the first English settlement in Ohio, was destroyed by French and Indians in 1752. The only settlements in Ohio at the beginning of the Revolution, Moravian communities near the present New Philadelphia, were broken up shortly afterward. From 1780 to 1785 Ohio was a theater of war between Indians and frontiersmen. By 1786 all state claims to any part of the Old Northwest had been waived (*see* CONFEDERATION, ARTICLES OF), except that Virginia reserved a tract between the Little Miami and Scioto Rivers, the Virginia Military District, to satisfy its soldiers' land warrants, and Connecticut withheld the Western Reserve until 1800. Urged by the second Ohio Company to facilitate the settlement of Ohio, the ORDINANCE OF 1787 was enacted. The national public lands system had its practical beginnings in Ohio, being applied in the sales of land to the Ohio Company—which founded Marietta on April 7, 1788, the oldest permanent settlement in the State—and to John Cleves Symmes and associate sponsors of Columbia, 1788, Cincinnati, 1788-89, North Bend, 1789, and the ill-fated French settlement of Gallipolis, 1790. Manchester and Chillicothe in the Virginia Military District were founded in 1791 and 1796, respectively; in the latter year Cleveland was established in the Western Reserve.

Gov. Arthur St. Clair and his associate officers introduced territorial government at Marietta in July, 1788. A peace treaty to which many tribes subscribed at Ft. Harmar, Jan. 9, 1789, was ineffective; St. Clair's punitive expedition in 1791 ended in rout, but Gen. ANTHONY WAYNE, given command of 3,000 soldiers whom he efficiently drilled and equipped before taking the field in 1794, defeated the Indians with great slaughter (*see* INDIANA). The resultant treaty, signed

at Greenville on Aug. 3, 1795, released extensive territory between the Great Lakes and the Ohio for settlement, and ended Indian warfare in Ohio. The white population increased from about 3,000 in 1790 to over 45,000 in 1800, New Englanders, Pennsylvanians, Virginians, and Kentuckians making up the immigrants. Pursuant to an enabling act passed by Congress, Apr. 3, 1802, a state constitution was adopted on Nov. 1, and on Mar. 1, 1803, the first state legislature convened. The capital, at Chillicothe in 1803-10 and 1812-15 and at Zanesville in the interim, was fixed at Columbus in 1816. Largely because of the notable immigration from New England, Ohio became a battleground of the anti-slavery movement. The most used channels of the UNDERGROUND RAILROAD crossed the state. The birthplace of seven presidents—Grant, Hayes, Garfield, Benjamin Harrison, McKinley, Taft, Harding—and usually since the Civil War a "doubtful" state, Ohio has enjoyed a conspicuous place in national politics. In 1932 its 26 electoral votes went to Roosevelt. George White, Democrat, was reelected governor, and Robert J. Bulkley, Democrat, senator.

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**OHIO COMPANY.** (1) An enterprise for promoting settlement in the Ohio valley, organized in 1748-49 by John Banbury and other London merchants in association with Thomas Lee, Lawrence Washington and other Virginia planters. The Crown in 1749 granted the company 200,000 acres south of the Ohio between the Monongahela and the Kanawha rivers, title to be confirmed after certain conditions of settlement had been met, and a conditional grant of 350,000 acres adjoining. The company dispatched Christopher Gist upon explorations, 1750 and 1751; erected storehouses at the mouth of Wills Creek, on the upper Potomac; built a road from Wills Creek to the Youghiogheny River, and made a few ventures in Indian trade. In 1752 the Crown approved an extension of grant. In 1770 the company was reorganized; but Indian hostilities in the interior, the French and Indian War, and lastly the Revolutionary War, defeated its colonizing aims. (2) The Ohio Company of Associates, organized in 1786 by Benjamin Tupper, Rufus Putnam, Manasseh Cutler, Winthrop Sargent, Thomas Cushing, Samuel Parsons and other ex-officers of the Revolution, for the settlement of the western territory. The company was largely instrumental in the shaping and passage of the ORDINANCE OF 1787. On July 27, 1787, Congress authorized the sale of about 1,500,000 acres along the north bank of the Ohio River to the company for 66⅔ cents per acre, payable in Continental currency at its face value, and options to purchase adjacent lands. Under the leadership of Rufus Putnam settlers sent out by the company established Marietta, the first permanent settlement in Ohio, in 1788.

**OHIO IDEA**, the proposal, vigorously agitated 1868-76, for the payment of United States bonds in

greenbacks, as a means of preventing the contraction of the currency. Most of the bond issues made no mention of the medium of payment; payment in gold was commonly assumed. The laws authorizing the issues of greenbacks specified that these notes should be legal tender in payment of all claims against the United States except interest on bonds. George H. Pendleton and other Ohio statesmen were prominent in sponsorship of the proposal to interpret these provisions against the bondholders. The Democratic platform in 1868 embodied the Ohio Idea; the theory received more complete expression in the formation of the **GREENBACK PARTY**.

**OHIO RIVER**, a large tributary of the Mississippi, formed by the junction of the Allegheny and Monongahela at Pittsburgh, Pa. It flows generally southwest, establishing the southern boundary lines of Ohio, Indiana and Illinois, and the northern border lines of West Virginia and Kentucky and discharges into the Mississippi at Cairo, Ill. The length of the stream is 981 mi. and the width varies from 890 ft. in the upper reaches to 5,910 ft. in its lower course. Its current which is quite rapid at its source, gradually lessens as the river widens and has a total fall of 400 ft. The volume of water fluctuates from 27,500 cu. ft. per second at low water to 1,500,000 cu. ft. at high water. Of the river's tributaries the largest are the Beaver, Miami, Wabash, Kanawha, Big Sandy, Kentucky, Cumberland and Tennessee.

Originally the channel of the Ohio was greatly obstructed throughout its entire length by snags, rocks, gravel and sandbars, and its width was exceedingly variable. Improvements, including dredging, locks and navigable dams, have been made, providing for slack water navigation from source to mouth throughout the year. To 1930 the cost of such work amounted to \$117,017,863.43 and the estimated annual maintenance was \$2,000,000. The cargoes carried by the river in 1929 aggregated 21,955,148 tons, of which 327,000 tons were steel. The remainder included chiefly coal shipments from the mines along the Monongahela to industrial plants on the Ohio, building materials and large quantities of crude oil.

The drainage basin of the Ohio, estimated at 214,000 sq. mi., covers the Allegheny plateau from New York to Alabama, comprising parts of Pennsylvania, Maryland, the Virginias, Kentucky, Tennessee, Ohio, Indiana and Illinois. The topography varies from flat and rolling agricultural lands in the western and northern portions, to rough and mountainous lands in the southern and eastern portions. The valley is unusually narrow for the size of the stream.

Of the important cities on the Ohio, the largest are Evansville, Ind., Louisville, Ky., Huntington, W. Va., Wheeling, W. Va., Cincinnati, O., and Pittsburgh, Pa. A number of large bridges span the stream, the most notable being the suspension bridges at Cincinnati and Wheeling.

**OHIO STATE UNIVERSITY**, at Columbus, O., a coeducational state institution, was established as the Ohio Agricultural and Mechanical College in

Columbus in 1870 in accordance with the provisions of the Federal Land Grant Act of 1862. In 1878 the Ohio legislature reorganized the institution, changing the name to Ohio State University and making the first appropriation for the furthering of higher education in the history of the state. It comprises colleges of Arts, Philosophy and Science, Commerce and Journalism, Dentistry, Education, Engineering, Law, Medicine, Pharmacy and Veterinary Medicine and a Graduate School. A laboratory for biological study is located at Sandusky. The institution had endowment funds in 1931 amounting to \$1,156,656. The library contained 380,000 volumes. In 1930-31 there was a student enrollment of 15,693, and a faculty of 851 headed by Pres. **GEORGE W. RIGHTMIRE**.

**OHIO UNIVERSITY**, at Athens, O., a coeducational state-controlled institution, founded in 1804. It comprises colleges of Liberal Arts and Education. The gross income available in 1931 totaled \$1,082,325. The library of 75,000 volumes contains a special collection of late 17th century and early 18th century English literature. In 1931-32 there were 2,557 students exclusive of the summer enrollment, and a faculty of 216 headed by Pres. **ELMER B. BRYAN**.

**OHIO WESLEYAN UNIVERSITY**, a privately endowed university for men and women, situated at Delaware, O., founded in 1841 by the Methodist Episcopal Church. The institution in 1877 incorporated the Ohio Wesleyan Female College, established in 1853. It now comprises a College of Liberal Arts, School of Art, School of Oratory and a Conservatory. The university's productive funds in 1931 were \$3,307,311. There were 132,000 volumes in the library. In 1931-32 there were 1,643 students, and the faculty of 175 members was headed by Pres. **EDMUND D. SOPER**.

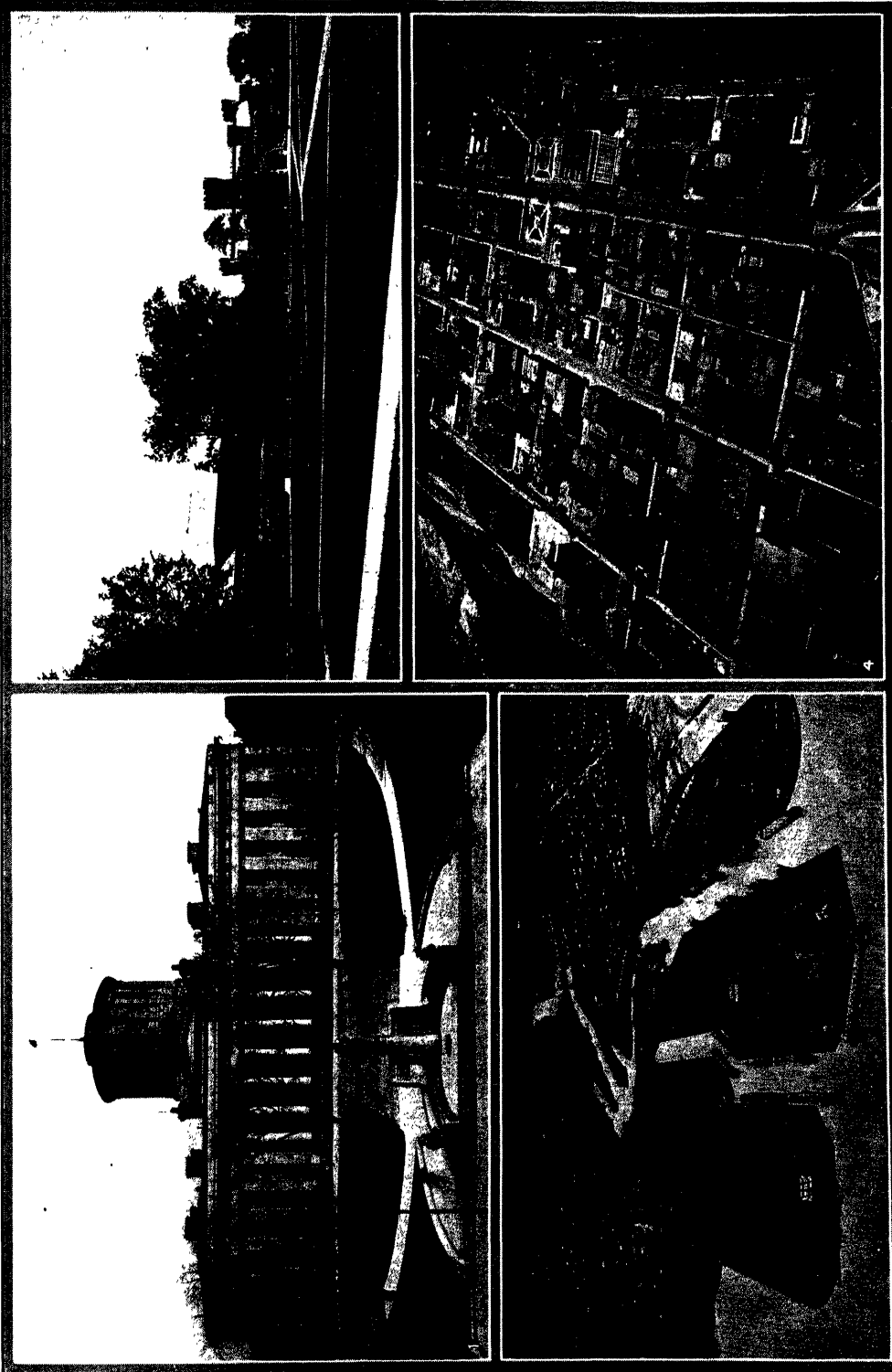
**OHM, GEORG SIMON** (1787-1854), German physicist, was born at Erlangen, Mar. 16, 1787. In 1817 he taught mathematics at the Jesuits' College, Cologne, and in 1826 at Berlin University. He became director of the Nuremburg Polytechnic School in 1833, and in 1849 was appointed professor of physics at Munich High School. Ohm worked extensively upon problems related to electricity and upon light interference. His work upon current conduction led him to formulate the mathematical laws of resistance. As a result the unit of electrical resistance received his name. He died at Munich, July 7, 1854.

**OHM**, a unit of electrical RESISTANCE. See ELECTRICAL UNITS.

**OHMMETER**. See RESISTANCE, MEASUREMENT OF.

**OIL BURNERS**. While oil has been used as a domestic fuel for many years, only comparatively recently have automatic burners reached a stage approaching perfection. The units are made in sizes suitable for the smallest home or for the largest office or hotel building. An installation consists of a fuel tank buried in the ground or set on a pipe frame in the basement; a burner with the necessary controls and ignition device; and a pump for transferring the oil from the tank to the burner. The function of

# OHIO



1. THE STATE HOUSE AT COLUMBUS. 2. VIEW OF THE CAMPUS OF OHIO STATE UNIVERSITY, COLUMBUS. AT THE LEFT IS HAYES HALL AND AT THE RIGHT THE OLD ARMORY. 3. AERIAL VIEW OF THE HARBOR AND DOCKS AT ASHTABULA. 4. CLEVELAND FROM THE AIR.

## THREE IMPORTANT CITIES OF OHIO







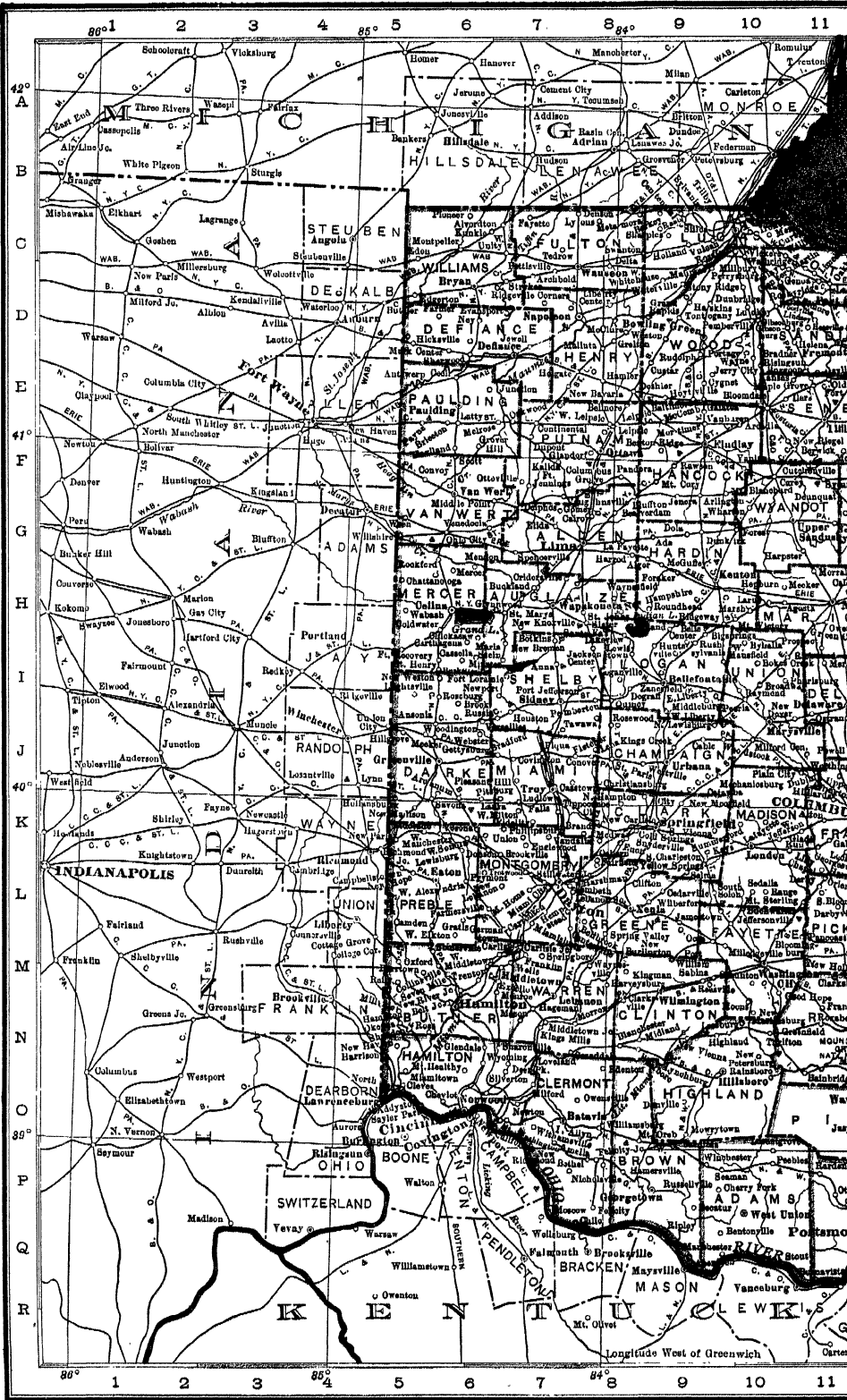
# OHIO

Area 41,040 sq. m.  
Pop. 6,646,997

## PRINCIPAL CITIES

### Pop.—Thousands

- 255 Akron... E 17
- 23 Alliance... F 19
- 11 Ashland... G 14
- 23 Ashtabula... B 19
- 7 Athens... N 15
- 24 Barberton... F 17
- 7 Bedford... D 17
- 13 Bellaire... K 20
- 10 Bellefontaine... 9
- 6 Bellevue... E 13
- 6 Berea... D 16
- 7 Bexley... K 12
- 7 Bowling Green... D 9
- 10 Bucyrus... G 12
- 15 Cambridge... K 17
- 15 Canton... F 20
- 105 Canton... C 18
- 5 Celina... H 10
- 8 Cheviot... O 5
- 18 Chillicothe... N 12
- 451 Cincinnati... O 5
- 7 Circleville... M 12
- 900 Cleveland... E 18
- 51 Cleveland Hts... O 24
- 291 Columbus... K 11
- 10 Conneaut... A 21
- 11 Coshocton... A 21
- 20 Cuyahoga Falls... F 18
- 201 Dayton... L 7
- 9 Defiance... D 6
- 9 Delaware... L 11
- 6 Delphos... H 17
- 10 Dover... H 17
- 40 East Cleveland... C 17
- 23 E. Liverpool... G 21
- 26 Elyria... D 15
- 13 Euclid... C 17
- 19 Findlay... F 10
- 13 Findlay... F 10
- 13 Fremont... E 11
- 8 Gallon... H 12
- 7 Garfield Hts... P 23
- 10 Girard... E 20
- 7 Greenville... J 6
- 52 Hamilton... N 16
- 17 Ironton... R 13
- 8 Jackson... O 13
- 8 Kent... E 18
- 7 Kenton... H 10
- 71 Lakewood... L 13
- 19 Lancaster... L 13
- 42 Lima... G 7
- 6 Logan... M 14
- 45 Lorain... O 14
- 34 Mansfield... P 24
- 6 Maple Hts... P 24
- 11 Marietta... M 18
- 31 Marion... H 11
- 15 Martins Ferry... J 20
- 26 Massillon... C 17
- 7 Miami... B 17
- 30 Middletown... M 7
- 9 Mt. Vernon... K 17
- 31 Newark... K 14
- 2 New Boston... Q 12
- 2 New Bremen... F 7
- 12 New Philadelphia... H 18
- 16 Niles... E 20
- 8 Norwalk... E 13
- 33 Norwood... O 17
- 7 Oakwood... E 7
- 11 Painesville... B 18
- 14 Parma... D 17
- 16 Piqua... J 7
- 43 Portsmouth... Q 11
- 8 Ravenna... E 18
- 6 Rocky Riv... C 16
- 11 Salem... F 20
- 25 Sandusky... D 13
- 18 Shaker Hts... P 24
- 6 Shelby... G 13
- 9 Sidney... I 7
- 69 Springfield... K 9
- 35 Steubenville... D 20
- 11 Struthers... E 20
- 16 Tiffin... F 11
- 291 Toledo... C 10
- 7 Toronto... H 20
- 9 Troy... K 7
- 7 Uhrichsville... L 18
- 8 Urbana... J 9
- 9 Van Wert... F 6
- 6 Wadsworth... F 16
- 41 Warren... E 20
- 8 Washington... H 21
- 8 Wellsville... H 20
- 11 Wooster... G 15
- 11 Xenia... L 9
- 170 Youngstown... E 21
- 36 Zanesville... K 16



13 14 15 82° 16 17 18 19 20 21 22 23 24 25



RAND McNALLY  
POPULAR MAP OF  
**OHIO**

SCALE 1:1,920,000  
1 inch = 30.3 Statute Miles  
1 Centimeter = 19.2 Kilometers  
Statute Miles

0 10 20 30 40  
Kilometers  
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A  
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13 14 15 82° 16 17 18 19 20 21 22 23 24 25



the burner is to convert the liquid fuel into its gaseous state and automatically to mix with the gas the amount of air requisite to COMBUSTION. Proper proportions are determined when the burner is installed, and are automatically maintained thereafter. Modern burners frequently operate completely through the heating season without any more attention than is given to an electric refrigerator. In nearly all localities, except those near to where coal is produced, homes may be heated with oil at no more cost than with solid fuel.

The first burners manufactured were made with little regard to scientific principles and the success with which some of them "atomized" the oil and mixed it with the air needed for its combustion depended largely upon chance. With increased knowledge of the principles involved and with better construction, high-pressure steam atomization burners gave much satisfaction, being especially noted for their reliability. But their high steam consumption was a serious matter and the substitution of high-pressure air where steam was not available did not prove entirely satisfactory. Purely mechanical atomizing burners were especially developed for marine use at an early date. The principle used was that of forcing the oil through a very small orifice at high pressure. Channels or slots were cut inside the orifice so that the oil came out with a distinct whirling motion. In addition, air needed for combustion was introduced at such a point that it crossed the path of the whirling oil and further atomized it. Such burners were very successful in large supervised installations but needed careful attention not always available in small and moderate-sized installations. To meet this need the rotating cup or plate burner was developed. In this type oil is thrown by centrifugal force from the edge of a rapidly rotating, motor driven cup or plate into air moving at an angle to its path. P. E. F.; E. R. L.

**OIL CITY**, a city in Venango Co., northwestern Pennsylvania. It is situated on the Allegheny River at the mouth of Oil Creek, 75 mi. north of Pittsburgh; it is served by river craft and three railroads. There is a municipal airport. The city has an altitude of 1,000 ft. above sea level. Oil City is a market and supply station for a highly productive oil district and has large refineries, machine shops and factories making oil well supplies, boilers, steel drums and other products. In 1929 the manufactured output was worth about \$13,000,000; the retail trade reached a total of \$13,082,697. The city was founded in 1869, after oil was struck in Titusville. It became a borough in 1863, a city in 1874. From 1860 to 1870 oil was at its peak; 17,000,000 barrels were shipped down the river to Pittsburgh. An oil exchange was established which regulated the price of oil for the world. Pop. 1920, 21,274; 1930, 22,075.

**OILED ROADS**, are those EARTH ROADS on which the surface is improved by applications of oil, which makes the surface more resistant to damage by rain and more resistant to abrasion from traffic—and, hence, less dusty. Good oiled roads must first be well made earth roads, on which the drainage is well taken care

of and the surface carefully shaped. Crowns of  $\frac{3}{4}$  inch per foot are desirable and the width of the oiled strip should be 18 feet or more to allow for lateral distribution of the traffic.

Nearly any commercial road oil can be successfully used, but the heavier oils are better. Oils are usually applied warm—120° to 200° F.—to lower the VISCOSITY, and on a surface reasonably free from dust. Less oil is required for clay soils than for silt soils and loams, but generally from 1 to 1½ gal. per square yard per season is needed. Higher type oil roads have oil incorporated in the earth several inches deep by oiling, harrowing and dragging. Oiling is also resorted to on the lighter type gravel roads to reduce the dust. Heavy oils are used on such roads as a binder but the result is classified as SURFACE TREATMENT. See also BITUMINOUS MATERIALS. W. W. H.

**OIL ELECTRIC LOCOMOTIVE.** See DIESEL LOCOMOTIVE.

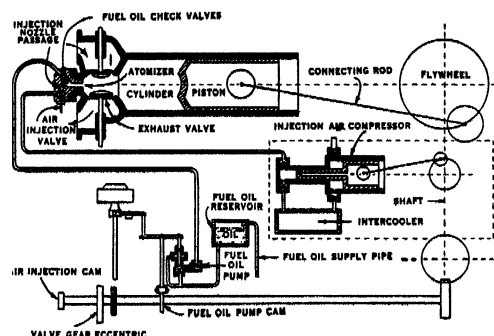
**OIL ENGINES** are INTERNAL COMBUSTION ENGINES capable of burning a heavy oil. In one type, ignition is effected by contact of the fuel with a hot bulbous extension of the cylinder head, this bulb being initially heated with a torch and then automatically kept hot by the combustion in the cylinder. The oil is injected into the bulb and is vaporized. The piston then forces part of the air charge into the bulb and ignition follows. In other designs, ignition is produced by an electric spark, the heavy oil being broken up into fine drops by a centrifugal device, and introduced along with the air charge. At present, the terms "Diesel engine" and "oil engine" are employed synonymously.

**Diesel Engines**, oil engines which draw in a "charge" of pure air and compress it to about 500 pounds per square inch, giving it a temperature of 1000 to 1200° F.; the fuel, a cheap petroleum distillate (see PETROLEUM REFINING) is injected into this mass of heated air when the piston reaches top dead center, and ignition occurs spontaneously. Since the efficiency of any internal combustion engine is increased by an increase in the compression ratio, which increase is limited in the spark-ignition gas engine by the pre-ignition tendency, the Diesel engine has a thermal efficiency much higher than that of the gasoline engine of 150 pounds per square inch and less compression pressure.

Basically, the Diesel engine has the same mechanical parts as the gas engine, but the carburetor and electrical ignition devices of the gas engine are replaced by fuel and air compression pumps on the Diesel. The compressor supplies air at a pressure of 900 pounds per square inch to blow the oil into the combustion chamber. The principal parts of the air-injection Diesel are shown in Fig. 1 on the following page.

More recently, the compressor has been eliminated, the oil being sprayed into the cylinder by a high pump pressure, often as much as 8000 pounds per square inch. This in effect has eliminated all the equipment shown in the broken-line square of Fig. 1. Two benefits result from this change: the work

needed to compress the injection air is eliminated, raising the thermal efficiency by about 5 per cent; and the first cost of the engine is reduced by the absence of the expensive compressor. In Fig. 2 are shown the several positions which the pistons pass through during one complete cycle of four strokes.



ON L. H. MORRISON, AME I  
FIG. 1. SCHEMATIC ARRANGEMENT OF AIR-INJECTION DIESEL ENGINE  
HILL BOOK CO.

Injection of the fuel without the spraying action of high-pressure air is by no means simple, and to insure satisfactory combustion three designs of combustion chambers (Fig. 3) have been developed. In one the oil is sprayed in relatively coarse drops into a small cavity where part of it is gasified and burned,

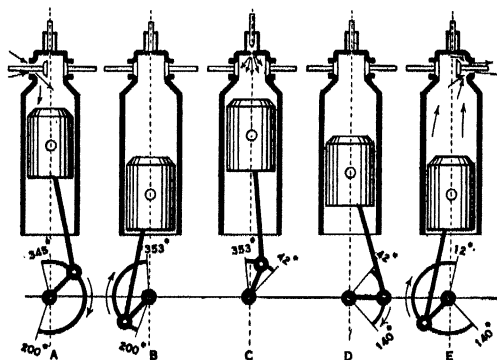
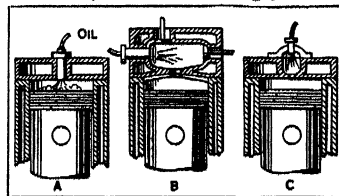


FIG. 2. PISTON POSITIONS IN DIESEL ENGINE DURING COMPLETE FOUR-STROKE CYCLE  
A, Air intake; B, Compression stroke; C, Oil injected; D, Working stroke; E, Exhaust stroke

the resulting rise in pressure spraying the remainder into the hot cylinder where combustion is completed. With the second type the oil is sprayed into a combustion chamber which is separate from the cylinder; combustion is completed in that chamber and only burnt gases enter the cylinder proper. In a third class the oil is sprayed directly into the cylinder, as is the case with the air-injection engine.

Diesel engines have a fairly uniform fuel consumption regardless of type, size and speed, averaging 0.42 pounds per brake-horsepower hour. This fuel may

vary from 14° to 36° Baumé gravity. Experience indicates that viscosity and carbon residue are the limiting factors in fuel utilization. Diesel engines are being used widely and increasingly in heavy duty



FROM L. H. MORRISON, AMERICAN DIESEL ENGINES, MCGRAW-HILL BOOK CO.

FIG. 3. COMBUSTION CHAMBERS OF DIESEL ENGINES

(A) Oil sprayed directly into cylinder;  
(B) Combustion completed in chamber separate from cylinder; (C) Combustion partly in cylinder, partly in separate chamber

power applications, such as in motor ships, Diesel and Diesel-electric locomotives and small power plants. See also DIESEL LOCOMOTIVES. L. H. Mo.

BIBLIOGRAPHY.—L. H. Morrison, *Diesel Engines*, 1931.

**OIL FUEL**, those fractions secured from crude PETROLEUM or SHALE OIL that are suitable for burning under boilers, in furnaces and in semi-Diesel and Diesel engines. See OIL ENGINES. Excepting a small amount of kerosene distillate sold for domestic furnace use, fuel oil is burned in a mechanically atomized form rather than as a vapor. The lighter grades, 32° to 36° Baumé gravity, are non-viscous and make excellent fuels for domestic furnaces and oil engines. Those of medium density, 24° to 30° Baumé are generally used for ordinary industrial purposes and in Diesel engines. The heavier oils, usually highly viscous, non-volatile and of high flash point, are used mainly in large industrial, marine and locomotive boilers. E. R. L.

**OIL LAMPS**, devices for burning oil to produce light, comprising an oil reservoir, a wick and burner and a chimney. Their origin has been traced to pre-historic times. The earliest types were open dishes of stone, clay and terra-cotta, to which a wick of reeds or grasses was later added. Still later the oil reservoir was covered leaving only a small hole for the wick.

No other radical change was made until late in the 18th century when glass chimneys were introduced. The chimney greatly steadied the flame and produced a draft which resulted in more complete combustion of the oil. A Frenchman, Argand, is generally credited with the introduction of the lamp chimney as well as the substitution of a cylindrical wick for the flat wick. The ARGAND BURNER is still widely used in lighthouse service. H. S. B.

**OIL PALM** (*Elaeis guineensis*), a valuable economic tree of the palm family, the source of palm oil and palm-kernel oil. The tree is a native of tropical West Africa where it covers large areas. It has been introduced into South America and the West Indies and elsewhere. It is a stately tree, about 25 ft. high,

crowned with large feathery leaves sometimes 15 ft. long. The very numerous flowers, crowded in a short spike, develop into an immense cluster of reddish-orange fruits (drupes). When ripe the fruit consists of a reddish pulp surrounding from 1 to 3 stones or nuts containing oily kernels. From the pulp is extracted palm oil, used in very large quantities in making soap and candles; it is also extensively utilized in the tin-plate industry and as a lubricant. Palm-kernel oil, called also palm-nut oil, obtained from the kernels of the crushed nuts, is employed in making soaps, perfumery, and chocolate products. The world's supply of palm oil is obtained chiefly from West Africa, Nigeria being the leading producer. Palm kernels, marketed chiefly from Nigeria, the Ivory Coast and French Guinea, are exported in bulk and the oil is extracted elsewhere. The total production of palm oil and palm-kernel oil in 1926 was estimated at about 400,000 tons.

**OILS**, generally viscous liquids of animal or vegetable origin, practically insoluble in water and easily inflammable. The mineral oils, consisting exclusively of hydrocarbons, as well as the products obtained from the distillation of coal tar, are usually considered a class of oils different from those described here. Oils are divided into two principal groups, the fatty oils, comprising the "fixed" oils and fats, and the volatile ethereal or **ESSENTIAL OILS**. The former consist chiefly of the glycerine esters of **FATTY ACIDS**, with admixtures of free acid, and are generally not pure compounds but varying mixtures of these glycerides, depending upon climate, soil and other conditions incidental to their production. It appears likely that in animals they are generated from similar vegetable products consumed, but in plants originate from the transformation of carbohydrates.

The distinction between fatty oils and fats is not sharp, and partly a question of temperature; the main division of the fatty substances is in animal oils and **VEGETABLE OILS** and fats, the latter being treated separately. **ANIMAL OILS** are represented by fish oils, liver oils, and blubber oils; animal fats by lard, bone-fat, tallow and butter. Fish oils are obtained by pressing out the entire fish, and find their use in the leather industry. Liver oils are secured chiefly from the codfish, and are given to children and invalids because of their high nutritive and medicinal value and richness in vitamins. (See **COD LIVER OIL**.) Blubber oils derived mostly from whales and seals are used for burning in lamps, and for soap-making. All fatty oils and fats are lighter than water, and insoluble in it, but soluble in ether, carbon tetrachloride and similar liquids. Their freezing point ranges down to 18° F. for linseed oil, while above 550° F. they decompose. Among the fatty acids from which they are derived, some are saturated, such as palmitic and stearic acid, others unsaturated, such as oleic acid. The latter take on iodine under special conditions and the amount of iodine absorbed, known as the iodine value, gives an indication of the percentage of unsaturated compounds present. Upon being

exposed to air and moisture, oils may become rancid, acquiring an acid taste and an unpleasant smell, and are subject to hydrolysis, being partly split into their acids and glycerine.

The ethereal or essential oils, which, in contrast to the fatty oils may be distilled without decomposition, are constituted chiefly from terpenes, aromatic alcohols, and ketones and their esters, phenol derivatives and some sulphur compounds. W. J. L.

**Coconut Oil**, is obtained from the flesh of the coconut, the fruit of the **COCONUT** palm. When ripe, the nuts are split in two and placed in the sun to dry. Upon drying the flesh shrinks and is easily detached from the shells. This dried material is called copra. The oil is abstracted from the copra by crushing either in screw-like expellers or by hydraulic pressure applied to the steam-cooked coarse meal. The crude oil thus obtained is refined by agitation with a water solution of caustic and allowed to settle. The caustic neutralizes the uncombined fatty acids converting them to soap which settles out together with mucilaginous and protein matters. The refined oil is then drawn off, bleached with Fuller's earth, filtered and deodorized by heating under reduced pressure with a current of dry steam blowing through.

The resulting product varies from a colorless liquid, in warm weather, to a soft white fat in consistency (at about 70° F.) which becomes rather hard and brittle when the temperature is 60° or lower. It is practically tasteless when properly made. Its chief fatty acid component is lauric acid. It contains but a very small amount of unsaturated fatty acid.

**Corn or Maize Oil** is obtained from the germ of **MAIZE**. The germs which are separated from the starchy endosperm of the **CORN** are dried and crushed in expellers. The crude oil is refined by alkali treatment, followed by bleaching with Fuller's earth and carbon and deodorizing. The refined oil is a yellow liquid possessing a characteristic maize flavor and odor. The principal fatty acid components of corn oil are **OLEIC** and **linolic** acids, constituting about 90% of the total.

**Cottonseed Oil** is obtained from the seed of the **COTTON** plant. The seed is decorticated and the meats which are separated from the hulls are crushed between rolls, treated with steam, packed in cloths and pressed in an hydraulic press. The crude oil which is dark in color is then subjected to the refining, bleaching and deodorizing operations. Sometimes the oil is chilled to separate out some of the high melting point "stearine" and the resulting oil is called "winterized."

The refined oil varies in color from golden yellow to nearly colorless and is nearly tasteless. The principal fatty acid components of cottonseed oil are **linolic**, **oleic** and **palmitic** acids.

**Olive Oil** is expressed from the pulpy fruit which covers the seed of the **OLIVE** tree. The olives are picked when almost mature and are crushed in edge mills of iron to separate the pulp from the seeds. The pulp is wrapped in cloth in the form of flat cakes

from which the oil is expressed by application of pressure. Several pressings are made, the cake being moistened with hot water or heated between pressings. The first pressing (cold) produces the highest quality or "virgin" oil. The virgin oil after filtration is yellow with a greenish tinge and possesses a characteristic bland flavor.

The principal fatty acid component of olive oil is oleic acid, which constitutes over 85% of the total.

**Peanut or Arachis Oil**, the best grade is obtained from the kernels of PEANUTS, free from the germ, by expeller or hydraulic pressing followed by refining, bleaching and deodorizing. The refined oil is light yellow to light brown in color and has a bland nutty flavor. The principal fatty acid constituents of peanut oil are olein and linolein with about 20% of the high molecular weight saturated acids.

**Cod Liver Oil.** The livers of the Cod fish after washing are steamed to disrupt them and to release the oil which rises to the top of the vat whence it is decanted and filtered through cloth. The oil is then chilled, and filtered to remove "stearine." Care is exercised to minimize exposure to air during the processes. The oil so produced from fresh livers is yellow in color and possesses a characteristic fishy flavor. Modern methods of treatment have reduced this flavor to a point where it is no longer objectionable to most people. This oil is used for its therapeutic value residing in its rich store of vitamin A and of vitamin D.

**Uses of Vegetable Oils.** While olive oil is the most highly prized salad oil, it has an important competitor in this use in cottonseed oil. Peanut and corn oils are also used as salad oils. These oils are also used for frying and in the manufacture of mayonnaise. In the latter case cottonseed and corn oil are the most important, cottonseed oil being preferred to corn oil for reasons of flavor. Corn oil is used in commercial mayonnaise in the winter because corn oil mayonnaise is less liable to break at low temperatures.

When fatty oils are hardened by the process of hydrogenation excellent shortening fats for baking purposes are produced. Enormous quantities of hydrogenated cottonseed oil are consumed in this manner.

Coconut oil is used mainly in MARGARINES known as "nut butters" and in fact constitutes the major portion of such margarines, a little hydrogenated peanut oil constituting the remainder of the fatty portion. Coconut oil and palm kernel oil in hydrogenated forms are used to the exclusion of all other fats in icings, coatings and fillers for cakes and fancy crackers. This is due to the fact that they possess no flavor nor odor, resist rancidity, lack the greasiness of shortening fats and as they melt in the mouth produce a cooling sensation which is agreeable.

A. W. T.

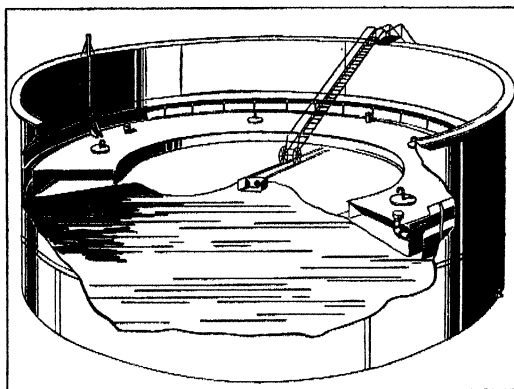
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**OIL SHALE**, a form of SHALE containing considerable amounts of KEROGEN, from which PETROLEUM can be obtained by distillation. Kerogen is a yellow to brown, or black, carbonaceous substance

thought to be the product of the partial decay of organic matter deposited with the muds and CLAYS from which the shale is formed. Oil shales, or kero-gen shales, are believed to be the sources of the more easily exploited petroleum deposits found in formations of higher porosity. Free oil is not yielded by oil shales, but is obtained only by heating them, a process applied commercially in Scotland. Frequently these shales are combustible, and their burning produces beds of hard, red, brick-like rock called porcelainite.

Enormous reserves of oil shale are known in Colorado, Utah, Wyoming and Nevada. The shales occur in lenses as much as 80 feet thick, yielding up to 90 gallons of oil per ton. They may become of commercial importance when the more easily exploited petroleum deposits approach exhaustion.

**OIL STORAGE.** Petroleum and its products are usually stored in steel tanks. At service stations the tanks are buried to reduce the fire hazard. In PETROLEUM refineries and storage centers or tank "farms," the tanks, running as high as 100,000 barrels in



COURTESY CHICAGO BRIDGE & IRON WORKS

CUT-AWAY VIEW OF PONTOON ROOF FOR OIL STORAGE TANKS

capacity, are isolated from each other by ditches and earthen walls, and equipped with modern fire fighting equipment. The roofs of tanks are now generally equipped with special devices to prevent evaporation. Concrete-lined reservoirs have been successfully used for the storage of heavy oils.

**OIL WELL TOOLS.** See DRILLING.

**OJIBWAY** or **CHIPPEWA**, a group of North American Indian tribes forming one of the two largest groups of the Algonkian-speaking peoples. Their territory included the region around the shores of lakes Michigan, Superior and Huron, extending west into Saskatchewan and north about halfway to Hudson Bay. In winter the Ojibway lived in dome-shaped lodges of bulrush mats or bark and in summer in square bark lodges, or occasionally in tipis. Garments were made of tanned deerskin, often ornamented with porcupine quills. They were not agricultural but manufactured maple sugar and harvested large quantities of wild rice. A well-defined system

of picture writing on bark was connected with religious ceremonies.

**OKAPI** (*Okapia johnstoni*), an African forest-dwelling relative of the giraffes. It inhabits the dense forests about the sources of the upper Congo basin, where its haunts are known almost exclusively to the Pygmy tribes, and museum specimens are rare. The okapi is similar in size to a pony or a large antelope, but has the small triangular head, sloping haunches,



COURTESY AMER. MUS. OF NATL. HISTORY

OKAPI, NATIVE TO AFRICAN FORESTS

short tail and other structural characteristics indicating its relationship to the giraffe; its neck, however, is normally short, for it feeds wholly on the leaves and young sprouts of the jungle, or its lush swamp vegetation, in the midst of which it dwells. In color the okapi is a rich chestnut, relieved by white cheeks and by zebra-like stripes, alternately chestnut and white, crossing the legs and hips. E. I.

**OKEECHOBEE, LAKE**, the largest lake of Florida, situated in the southern part of the state. Its area is about 730 sq. mi., its maximum depth 15 ft., and its mean elevation above sea level 20.5 ft. It receives the Kissimmee River from the north and discharges its surplus waters through canals leading to the Atlantic and Gulf. Cypress swamps border its eastern and northern shores and the EVERGLADES lie to the south.

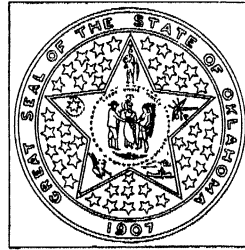
**O'KEEFFE, GEORGIA** (1887- ), American painter, was born at Sun Prairie, Wis., Nov. 15, 1887. She was a pupil of Chase, and also studied under Vanderpoel, Dow and Alon Bement. She has worked chiefly in New York City, at Lake George, N.Y., and in Mexico. She is especially noted for her abstract flower paintings. Examples of O'Keeffe's work hang in the Phillips Memorial Gallery, Washington, and the Brooklyn Museum of Art.

**OKHOTSK, SEA OF**, a broad inlet of the Pacific Ocean, indenting the east coast of Siberia. It is separated from the Pacific by the Kamchatka peninsula and chain of Kurile islands, and communicates with

the JAPAN SEA through La Perouse Strait. Within these limits its area is about 600,000 sq. mi. Its average depth is 2,750 ft., the maximum depth 11,060 ft. Heavy fogs gather over its waters and severe storms are a frequent occurrence.

**OKINAGAN**, a North American Indian tribe of the Salishan linguistic stock. They formerly occupied the west side of the Okanogan River in Washington from old Ft. Okanogan to the Canadian boundary and the district around Okanogan Lake in Canada. They now live on the Colville Reservation in Washington and the Kamloops-Okanogan Agency in British Columbia.

**OKLAHOMA**, one of the south central states of the United States, popularly called the "Sooner State," situated between 33° 35' and 37° N. lat. and 94° 29' and 103° W. long. It is bounded on the north by Colorado and Kansas, on the east by Missouri and Arkansas, on the south by Texas, and on the west by Texas and New Mexico. Oklahoma comprises an area of 70,057 sq. mi., inclusive of 643 sq. mi. of water surface. In size



OKLAHOMA STATE SEAL

Oklahoma ranks seventeenth among the states of the Union.

**Surface Features.** In general Oklahoma is a plain sloping gradually to the southeast. Topographically it belongs partly to the semi-arid Great Plains and partly to the humid central lowlands. The former region occupies all of the panhandle and in addition, Roger Mills, Ellis, Harper, Woodward and Woods counties. It has a generally high elevation culminating in the Black Mesa, 4,978 ft. high, in Cimarron Co., the highest point in the state. The lowest is the Red River, 300 ft., in McCurtin Co., and the mean elevation is 1,300 ft.

The central lowlands or prairie plains are diversified by several highland regions. The Ozark plateau, which extends into northeastern Oklahoma from Missouri and Arizona, consists of an upland 1,000 ft. high, cut by stream valleys into broad, flat-topped hills with steep slopes. The valleys and slopes are timbered but many of the hill tops are treeless.

South of the Arkansas River valley, in southeastern Oklahoma, is the Ouachita Mountain region extending westward from Arkansas. This is a well-timbered, rugged area, broken into east and west ridges of which Rich Mountain in Leflore Co. rises to 3,000 ft.

In Murray, Johnson and Pontotoc counties in south central Oklahoma are the Arbuckle Mountains covering an area of 860 sq. mi. They consist of a dissected plateau sloping from a height of 1,350 ft. at the west to 750 ft. at the east. The hills and ridges are mostly grass land while the valleys are timbered. The Wichita Mountains which extend from Lawton in Comanche Co. north and west across Kiowa Co. to



Granite in Greer Co., consist of ranges and groups of hills composed principally of a pinkish granite. They rise abruptly 700 to 900 ft. above the plains and many have individual names. The central portion of the group is sometimes called Raggedy Mountains and the highest peaks are Mt. Scott, Saddle Mountains, Haystack and Mt. Baker.

The entire state lies within the Mississippi River basin and is drained by two major streams—the Red River of Texas and the Arkansas with its tributaries, the Canadian and Cimarron rivers.

**Climate.** The climate is marked by wide seasonal changes in temperature. The mean annual temperature for the state is 60.3° F. At Oklahoma City, the average for January is 36.4° F. and for July 80.6° F. During the period 1893-1930 the highest temperature recorded in Oklahoma was 118° F. and the lowest, -27° F. The average annual precipitation is 32.8 in. At Oklahoma City the growing season averages 216 days.

**Forests and Parks.** Originally Oklahoma had more than 12,000,000 acres of forest land out of a total land area of 44,424,960 acres. Practically all of this has been cut over. A total of 11,741,000 acres, in a 1931 estimate, is still covered with some sort of tree growth and is found chiefly in the southern coniferous forest region of the Wichita Mountains and in the deciduous forest region in the Ozarks and the north-eastern part of the state. About 3,480,000 acres are in farm woodlots. Shortleaf pine is the most important timber tree and covers approximately 4,000,000 acres of which 675,000 acres are virgin stands. Other trees include oak, hickory, ash, cottonwood and red gum. The forests have been frequently and seriously damaged by fire. There are neither state-owned forests nor forest parks. Three state game preserves have been established and land in 39 counties has been leased for game refuges and is used as breeding grounds for ring-necked pheasants, prairie chickens, wild turkey, bob-white quail and whitetail and black-tail deer. Wichita National Forest with a total net area of 61,480 acres in 1930 is located in the Wichita Mountains. Sulphur springs with supposed curative properties are protected within PLATT NATIONAL PARK.

**Minerals and Mining.** Oklahoma owes its pre-eminence in mineral production to its vast oil and gas fields, extending over more than 40 counties, in general centering about Tulsa, and yielding in 1929 89% of the value of the mineral output of the state. Second in importance are the rich deposits of zinc and lead ore in Ottawa County in the extreme northeast. Valuable beds of bituminous coal underlie several counties in the eastern part of the state. There are also important deposits of limestone, gypsum and asphalt.

With mineral production in 1929 amounting to \$516,685,232, or 10% of the total for the United States, Oklahoma stood third among the states, ranking first in petroleum and zinc, second in natural gasoline, fourth in natural gas, lead and asphalt, and twelfth in coal. The outstanding mineral product was petroleum, 255,004,000 bbls. valued at \$364,650,000, together with natural gas, 357,893,000 M cu. ft., \$53,528,000; and nat-

ural gasoline, 676,030,000 gals., \$42,766,000. Among other important products were zinc, 192,042 tons, \$25,349,544; coal, 3,774,080 tons, \$11,481,000; lead, 46,513 tons, \$5,860,638; gypsum, 369,433 tons, \$2,255,374; clay products, \$1,892,919; limestone, \$1,775,772; sand and gravel, 2,904,897 tons, \$1,612,755; and asphalt.

During 1929 281 mines and quarries gave employment to 11,018 persons who received \$15,550,535 in salaries and wages.

**Soil.** Rich alluvial deposits along the valleys of rivers are the most highly productive soils in Oklahoma. In general a dark red, usually fertile loam is the most common soil throughout the state, but it varies from sandy to clayey in character. Western Oklahoma, which is a lofty tableland and very dry, is covered by thin deposits of loess containing but little humus.

**Agriculture.** In value of farm products Oklahoma ranks among the leading states. The most important crops are cotton, wheat and corn.

In 1930 33,790,817 ac. or 76.1% of the entire land area was in farms, 203,866 in number, with an average size per farm of 165.8 ac. and an average value per acre of \$36.78. Of the farm area 17,333,174 ac. or 51% was crop land; 14,639,512 ac. or 43%, pasture land; and 492,521 ac. or 1%, woodland. The total value of farm property was \$1,477,741,548, of which \$1,242,723,526 was represented by land and buildings; \$92,857,906, by implements and machinery; and \$142,160,116, by domestic animals.

According to the census of 1930 Oklahoma produced in 1929 field crops to the value of \$245,560,631, ranking tenth among the states. It stood fourth in wheat and sixth in cotton and cottonseed. In minor crops it ranked second in pecans, seventh in watermelons and blackberries, tenth in plums and prunes and eleventh in peaches. The most valuable crop was cotton, 1,130,415 bales grown on 4,148,228 ac. and valued at \$88,737,578, together with cottonseed, 534,123 bales, \$16,557,813. Of grain crops valued at \$102,053,737, wheat, 51,184,128 bu. produced from 4,575,558 ac., was foremost. Other important grains included corn 44,830,439 bu., oats 16,196,880 bu., and barley 1,138,515 bu. The remaining crops included hay and forage, 1,139,961 tons, valued at \$18,465,327, largely wild grasses and alfalfa; vegetables, \$11,969,831, and fruits and nuts, \$3,745,564. Among the vegetables were potatoes \$3,776,066, sweet potatoes \$1,535,018, watermelons \$539,823 and tomatoes \$408,151. The leading fruit and nut crops were peaches 1,115,944 bu., apples 487,406 bu., pears 310,757 bu., plums and prunes 134,599 bu., grapes 5,489,328 lbs., strawberries 3,794,639 qts., blackberries 1,835,409 qts. and pecans 5,718,978 lbs.

Farm products sold by cooperative marketing rose from \$8,055,084 in 1919 to \$23,489,243 in 1929. Farm machinery and equipment in 1930 included 127,448 automobiles, 23,930 motor trucks, 25,962 tractors, 2,418 electric motors and 9,363 stationary gas engines.

**Irrigation.** Between 1905 and 1910 irrigation was developed to a limited extent in a few western

counties. According to the Census of 1930 the total number of irrigated farms was 99, with an aggregate area of 57,367 ac., of which 1,573 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$1,671,866, or an average of \$29.14 per ac. The total investment in irrigation enterprises to 1930 was \$160,099 and the average cost of maintenance and operation for 1929 was \$7.62 per ac.

**Animal Industry.** Cattle-raising is the chief livestock interest. According to the census of 1930 Oklahoma ranked sixteenth among the states in total value, \$142,160,116, of domestic animals. Among these were 2,097,576 cattle reported from 164,784 farms or 81% of all farms in the state and valued at \$84,090,907; horses, 505,620 in number valued at \$19,797,460; mules, 315,353, \$17,840,918; swine, 1,051,190, \$9,854,420; sheep, 221,616, \$1,407,401; goats, 40,420, \$136,760, and asses and burros, 3,261, \$91,688.

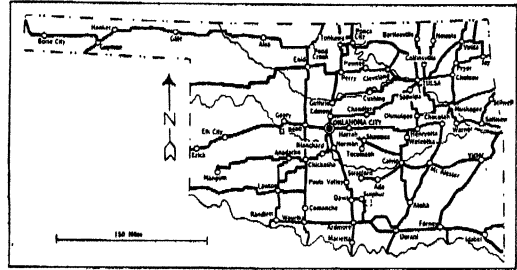
Of the cows on farms, 702,704 were kept mainly for milk production and 338,000 mainly for beef production. In 1929, 249,251,003 gals. of milk were produced; the total value of dairy products sold was \$24,485,344. The value of all poultry raised was \$18,251,025. The number and value of the chief kinds were chickens, 23,291,731, \$16,181,933; turkeys, 804,262, \$1,925,728; geese, 66,567, \$81,035, and ducks, 96,994, \$62,329. The chickens sold, 8,359,520 in number, were valued at \$6,095,029. Of 80,513,723 doz. chicken eggs produced, valued at \$20,165,240, 49,738,573 doz., with a value of \$12,445,992, were marketed. Honey, amounting to 910,441 lbs. valued at \$167,854, was produced from 58,677 hives.

**Fisheries.** The commercial fisheries of the state are almost nil, the total catch amounting to 354,000 lbs., valued at \$31,000 in 1930. There is little to attract the sportsman, although 81,000 fishing licenses were issued in 1930, and \$81,000 received in fees. Five fish hatcheries were operated during that year by 18 men at a cost of \$100,000, the output being 924,120 bass and 155,750 other game fish.

**Transportation.** The Missouri, Kansas and Texas railroad constructed a line across Oklahoma to Denison, Tex., in 1872, while it was still a territory. After the territory was opened to white settlement in 1889, expansion of railway facilities was rapid. In 1930 the total steam railway mileage in the state was 6,682. The principal systems include the Rock Island, the Santa Fé, the Missouri, Kansas and Texas, the St. Louis and San Francisco and the Kansas City, Mexico and Orient lines.

The state's highway system is showing constant improvement and extension. Including the principal through routes, there were 125,534 mi. of highway on Jan. 1, 1930, of which 4,774 mi. were surfaced roads and 2,928 mi. were improved state highways. During 1929, highway expenditures amounted to \$24,516,255, of which \$11,766,255 was paid by the state and \$12,750,000 by county and local governments. Gasoline consumption in 1930 aggregated 323,112,000 gals. The state gasoline tax produced an income of \$12,092,420 that year as against \$6,212,409 in 1926. Motor

vehicle registrations were 550,331 in 1930 compared with 424,345 in 1925. The rapid growth of transportation by truck is indicated by registrations which rose from 31,298 in 1925 to 59,384 in 1930, or nearly 100%.



OKLAHOMA STATE ROADS

During the same period, the number of buses in operation increased from 1,072 to 1,507, or approximately 50%.

**Manufactures.** Mineral and agricultural resources form the basis of the state's manufacturing industries.

According to the Census of 1930 Oklahoma with manufactures for 1929 valued at \$455,905,297 stood twenty-ninth among the states, ranking fifth in petroleum refining, sixth in cottonseed oil and twelfth in flour. Its 1,658 establishments gave employment to 6,943 officers and employees, who received \$16,326,552 in salaries, and to 31,695 wage earners, who were paid \$41,276,993 in wages. These factories used a total of 223,257 horse power, expended \$12,073,892 for fuel and power, and \$294,427,605 for materials and supplies, and added by the process of manufacture \$149,403,800 to the value of their output.

In this output there were 49 separately enumerated manufactures. Petroleum refining, with products valued at \$183,681,931, comprised 40% of the total output of the state. Other important items in order of value were flour, \$28,602,038; cottonseed oil, \$20,052,498; printing and publishing, \$19,874,587; foundry and machine shop products, \$15,467,328; bread, \$13,222,090; zinc smelting, \$12,732,286, and butter, \$11,483,912.

The principal manufacturing cities with value of output were Oklahoma City, \$81,002,795; Tulsa, \$26,802,337; Muskogee, \$14,826,720, and Enid, \$10,447,045.

**Commerce.** According to the census of 1930, there were in 1929 4,183 wholesaling establishments in Oklahoma, with total sales of \$776,887,481. These organizations gave full-time employment to 19,404

## CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive .....	7,115	\$215,924,552	27.19
Food .....	6,279	145,814,100	18.38
General Mdse. ....	3,321	145,706,146	18.36
Lumber & Bldg. ....	1,496	71,091,285	8.94
Apparel .....	1,113	44,733,152	5.63
Furn. & Household ..	996	35,116,934	4.43
All other stores ....	7,170	135,483,054	17.07
Total, all stores ..	27,490	\$793,869,223	100.00

men and women, whose annual salaries and wages aggregated \$31,086,674. The chief wholesaling centers are Tulsa and Oklahoma City.

The total sales of the 27,490 retail stores amounted to \$793,869,223. Sales per store averaged \$28,878; sales per capita were \$331.33.

**Finance and Banking.** The assessed value of all taxable property in 1929 was \$1,829,755,215. The total bonded debt in 1930 was only \$2,050,200, while cash on hand, undistributed to various state funds, aggregated \$10,959,596. Total state revenues in 1928 were \$33,654,688; total disbursements, \$34,521,338. The chief sources of income were property taxes, \$5,653,200, and licenses, \$16,353,900. This latter item includes insurance, corporation and mine taxes, as well as motor vehicle taxes and gasoline taxes of \$5,449,113. The principal payments were for highways, \$15,115,785, educational aid, \$2,992,333, permanent improvements, \$3,880,026 and general department operation.

A feature of Oklahoma's banking system is a fund for the guaranty of deposits in state banks. The legality of this law was tested in the U.S. Supreme Court in 1908, and it was held to be valid. There were 572 banks in Oklahoma in 1930. Of these, 264 were national banks and 308 state banks and trust companies. Their total capitalization was \$34,502,858; their surplus and undivided profits, \$19,645,000. Total resources were \$515,545,000, with loans and discounts aggregating \$246,531,000. Total demand and time deposits were \$399,942,000 in 1930. Per capita demand and time deposits were \$166.44; per capita savings deposits, \$33.10. The total savings of \$79,545,000 were owned by 147,915 depositors. National bank circulation aggregated \$6,275,000.

**Government.** The legislative body of Oklahoma consists of a Senate composed of 44 members and a House of Representatives of from 97 to 107 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 60 days. The chief executive is the governor elected for a term of four years but ineligible to succeed himself as a candidate for office. He receives a salary of \$4,500 per annum. Judicial power is vested in a supreme court, district courts, county courts, courts of justices of the peace, and municipal courts. The supreme court consists of 9 judges elected for terms of six years at salaries of \$6,000 per year.

**Social Welfare Institutions.** There is a training school for white boys at Pauls Valley and one for colored boys at Boley. The industrial school for white girls is at Tecumseh and for colored girls there is an industrial home at Taft. At Granite there is a reformatory. Hospitals for the insane are located at Norman, Vinita, and Supply; tuberculosis sanitariums are at Clinton and Talihina. The feeble-minded have an institute at Enid. A home for deaf, blind and orphaned colored children is at Taft, and orphanages for white children are situated in Pryor and Helena. At Oklahoma City is a hospital for crippled children and the university hospital. A home for Federal sol-

diers is maintained at Oklahoma City and one for Confederate soldiers at Ardmore. The penitentiary is at McAlester. A State Commission of Charities and Corrections is elected by the people for the supervision of the above institutions.

**Education.** The first schools were government Indian schools established before Oklahoma Territory was opened to settlement. The first white schools were opened in Guthrie, El Reno, Kingfisher and some other towns in 1889, and a high school was opened at Kingfisher that same year. When Oklahoma was organized as a territory in 1890, a public school system was immediately put in force. Separate schools are provided for Negroes. In 1928 there were 5,989 public school buildings, with 588,038 pupils in the kindergartens and elementary schools, and 95,781 pupils in the secondary schools. Children from 8 to 16 years of age are required to attend school 66% of the school year.

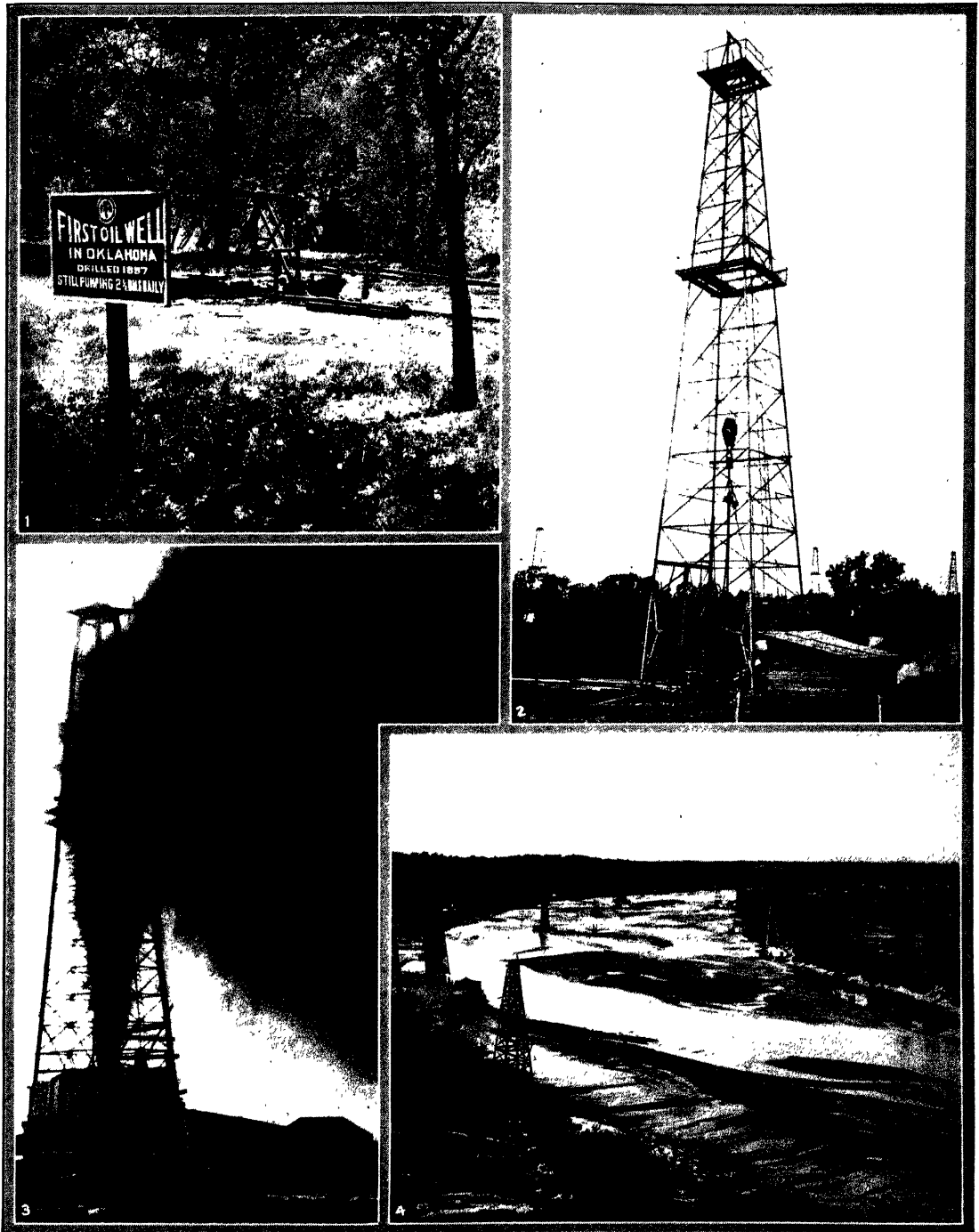
The number of persons from 5 to 20 years of age attending school in 1930 was 592,921, or 70.2% of the population within the ages specified, as compared with 481,253, or 63.8%, in 1920. The number of persons 10 years and over unable to read and write in 1930 was 51,102, or 2.8%, as compared with 56,864, or 3.8%, in 1920.

The institutions of higher learning maintained by the state include the University of Oklahoma at Norman, the Agricultural and Mechanical College at Stillwater, Oklahoma College for Women at Chickasha, Eastern Oklahoma College at Wilburton, teachers' colleges at Durant, Edmond, Ada, Weatherford, Alva and Tahlequah, and the Colored Agricultural and Normal University at Langston. Other educational institutions are Phillips University at Enid, Oklahoma City University, and the University of Tulsa. The Oklahoma Library Commission has its headquarters in the State Capitol building at Oklahoma City.

**Population.** In 1930 Oklahoma ranked twenty-first among the states with a population of 2,396,040, or an average of 34.5 per sq. mi., an increase of 367,757 or 18.1% over 1920. The population rose from 258,657 in 1890 to 790,391 in 1900, 1,657,155 in 1910, and 2,028,283 in 1920. In 1930 there were 2,123,424 or 88.6% whites, 172,198 or 7.2% Negroes, and 92,725 or 3.9% Indians. Of the whites, 2,096,671 were native-born and 26,753 were foreign-born, a decrease in the latter of 13,215 since 1920. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 37,990 or 29.4% were German, 13,249 or 10.3% English, and 12,849 or 10.0% Russian. The rural population was 1,574,359 or 65.7% of the total, an increase of 85,556 or 5.7% from 1920; the urban population was 821,681 or 34.3% of the total, an increase of 282,201 or 52.3% from 1920. There were in 1930 five cities of 20,000 and upwards: Oklahoma City, 185,389; Tulsa, 141,258; Muskogee, 32,026; Enid, 26,399; Shawnee, 23,283.

**Occupations.** In 1930 828,004 persons, or 34.6% of the population, were gainful workers 10 years old or older; 84.4% of these were males and 15.6% were

## OKLAHOMA



COURTESY OKLAHOMA STATE CHAMBER OF COMMERCE

### OIL WELLS IN OKLAHOMA

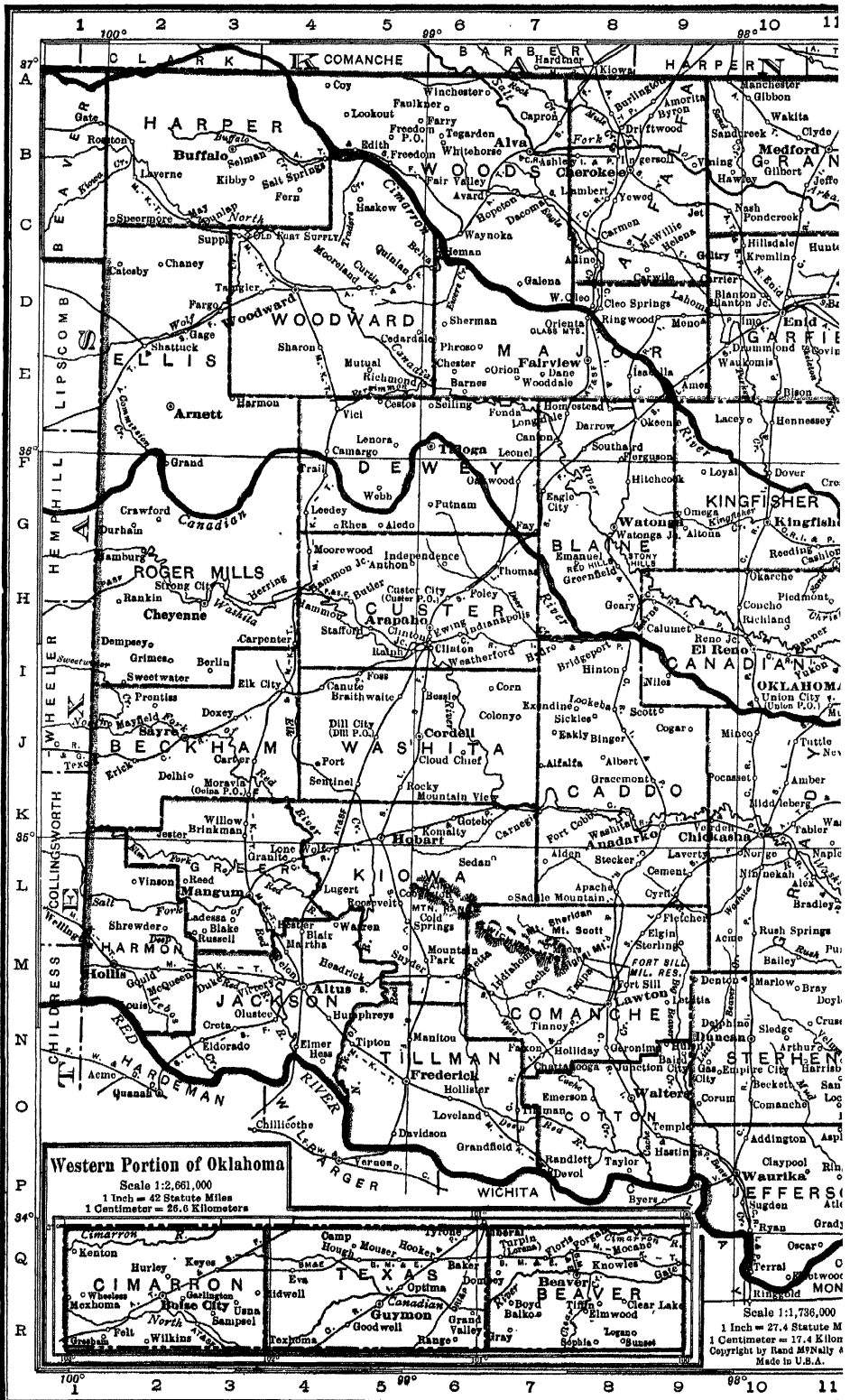
1. The first Oklahoma oil well, showing the original pump which is still in operation. 2. A modern all-steel rotary drilling rig, the type used throughout the Oklahoma City

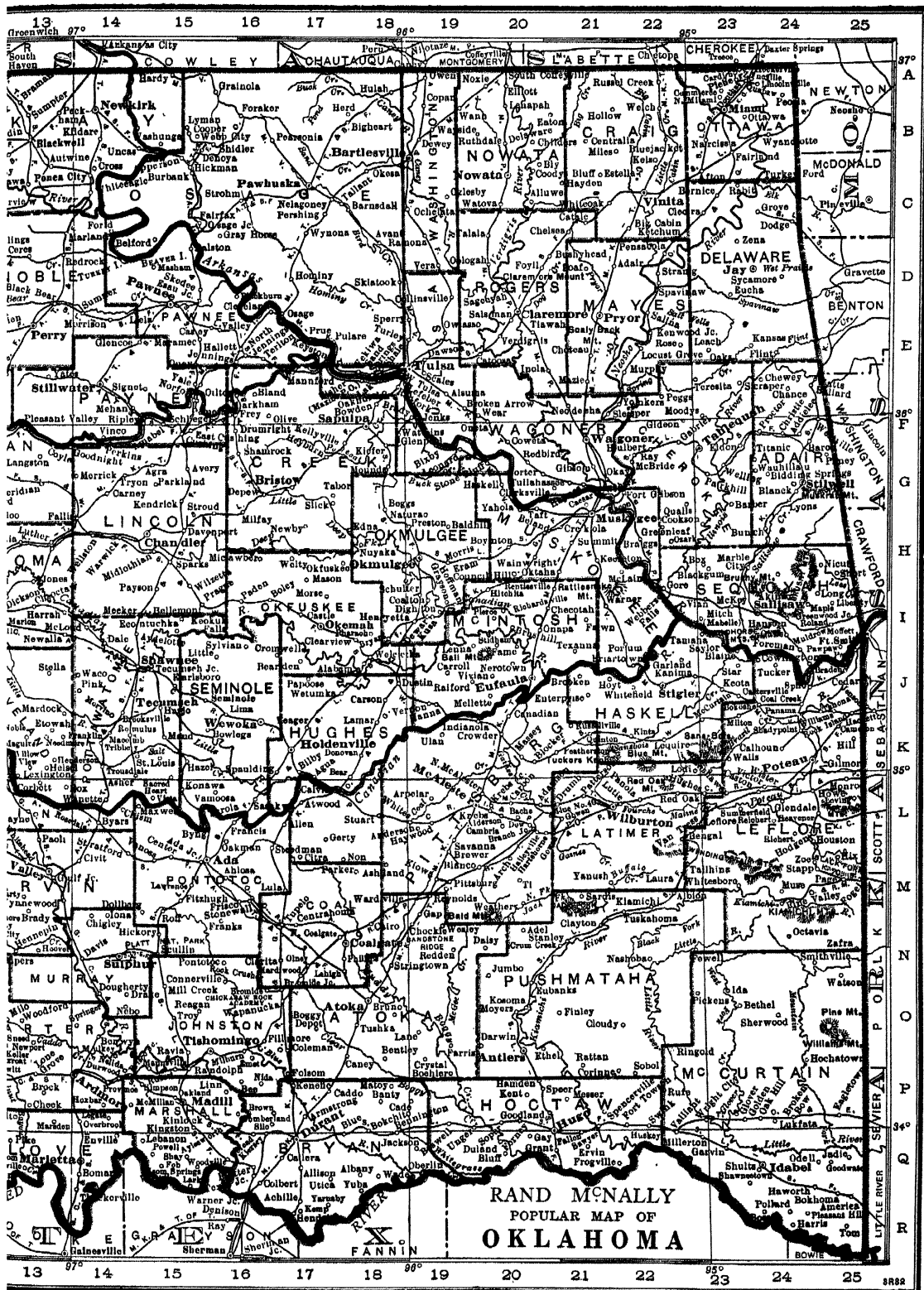
field. 3. Discovery Well in the Oklahoma City field which brought in 6,000 barrels an hour on Dec. 4, 1928. 4. Drumright and Cushing Field in Payne County.





## PRINCIPAL CITIES









females; 86.5% were native white; 1.8% foreign-born white; 8.6% Negro, and 3.1% other races. Among the chief occupations, with number of workers, were farmers, 199,238, and farm wage workers, 64,905; salespersons, 24,896 men and 8,386 women; retail dealers, 29,720; oil well operatives, 26,628; servants, 5,271 men and 20,176 women; school teachers, 5,288 men and 16,887 women; clerks, 14,656 men and 7,308 women; factory laborers, 15,953; carpenters, 13,945; factory operatives, 13,643 men and 2,242 women; chauffeurs, 13,003; bookkeepers and cashiers, 11,504, and engineers, 10,840.

### HISTORY

CORONADO visited Oklahoma in 1541. French *coureurs de bois* are known to have trapped and traded in eastern Oklahoma. The region, except the Panhandle strip, was part of Louisiana, and as such passed to the United States in 1803. Culminating a movement begun in 1809 to transport Indian tribes whose habitations were in the path of white settlement to distant and presumably permanent homes, Congress in 1834 set apart an area of "unorganized or Indian country," including Oklahoma. Oklahoma was apportioned among six tribes, the Cherokee, Chickasaw, Choctaw, Creek, Quapaw and Seminole. Negro slaves were brought by many Indians who came from the southern states. At the conclusion of the Civil War the Federal Government, partly to make provision for the Negroes in their altered status, demanded a new set of treaties in 1866, which reduced the original reservations. Within the next 17 years Indians of many tribes—Sac and Fox, Kiowa, Apache, Comanche, Cheyenne, Arapaho, Osage, Kansas, Shawnee, Pottawatomie, Wichita, Pawnee, Nez Perce, Ponca, Otoe, Missouri, Iowa, Kickapoo—were located in Oklahoma. The greater part of the Cherokee strip along the northern boundary and a desirable tract in the center of Oklahoma remained unassigned. Agitation, fostered by David L. Payne and other "boomers," for the opening of these lands for white settlement increased until the Government purchased a perfect title to the central tract, and Apr. 22, 1889, opened the region to homestead entry. The tract was settled almost in a day. Cattlemen had previously been enjoined from the practice of leasing grazing grounds from the tribes. Answering vehement demand, additional tracts were opened to homesteading in 1891, 1893, 1895, 1901 and 1906. Oklahoma Territory was created on Mar. 2, 1890. George W. Steele was the first governor; the first legislature met at Guthrie, Aug. 27. Congress in June, 1906, provided for the admission of Oklahoma and the Indian Territory to the Union as one state, if both whites and Indians approved. Delegates in convention at Guthrie drafted a radical constitution which legalists deplored; but popular ratification, Sept. 17, 1907, was overwhelming. On Nov. 16 President Roosevelt proclaimed Oklahoma the 46th state of the Union. Oklahoma City supplanted Guthrie as the capital in 1910. With the spectacular rise of the petroleum in-

dustry, the state entered upon a prosperous era which survived declines in the livestock industry and in the value of dry-farming produce. In 1930, however, a severe drought coincided with drastic depression in the petroleum industry; Governor Murray immediately enforced a shutdown of production and was moderately successful in restoring the value of the product. In 1932 Oklahoma gave its 11 electoral votes to Roosevelt and reelected Elmer Thomas, Democrat, to the United States Senate.

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**OKLAHOMA, UNIVERSITY OF**, at Norman, Okla., a state university for men and women founded in 1890. It comprises colleges and schools of Arts and Sciences, Fine Arts, Engineering, Journalism, Social Science, Home Economics, Business, Education, Pharmacy, Law and Medicine, a Training School for Nurses and a Graduate School. The state appropriations in 1931 totaled \$1,963,374. The library of 130,000 volumes contains special collections on the Oklahoma Geological Survey and the State Industrial Chemical Library. In 1931-32 there was a student enrollment of 5,273, and a faculty of 273 headed by Pres. WILLIAM BENNETT BIZZELL.

**OKLAHOMA BAPTIST UNIVERSITY**, a co-educational institution located at Shawnee, Okla., and founded in 1912. It is privately controlled and affiliated with the Baptist Church. The productive funds in 1931 totaled \$17,598. There were 7,735 volumes in the library. In 1931-32 there were 400 students, and a faculty of 42 headed by Acting Pres. R. E. Crump.

**OKLAHOMA CITY**, the capital of Oklahoma, a city in the central part of the state, the county seat of Oklahoma Co. It is situated on the North Canadian River, 200 mi. northwest of Dallas, Tex. Airplanes, bus and truck lines and six railroads serve the city. It is the commercial and industrial center of the state, an important shipping point for cotton and horses. The handsome state capitol, public buildings and residences are in every way modern. The city is the seat of Oklahoma City University and the hospital and medical college of the University of Oklahoma.

This city has a large insurance business and many oil developing companies. The important industries include cotton and cottonseed oil manufacture, meat packing, machine and iron work. In 1929 the total factory output was worth about \$81,000,000. The wholesale trade proper in 1929 amounted to \$119,913,075; the retail to \$119,531,593. The oil wells in the vicinity are among the richest in the world, and account for most of the prosperity of the community. Oklahoma City was a tent colony of 10,000 people in 1889; the city was chartered in 1890, and became the state capital in 1910. Pop. 1920, 91,295; 1930, 185,389.

**OKLAHOMA CITY UNIVERSITY**, at Oklahoma City, Okla., a coeducational institution, was founded in 1911 at Guthrie. It is privately controlled and affiliated with the Methodist Episcopal Church.

On its removal to Oklahoma City it was united with Epworth University, founded in that city in 1904. The grounds and buildings were valued in 1931 at \$750,000. In 1930 there was a student enrollment of 1,404, and a faculty of 46 headed by Pres. Eugene M. Antrim.

**OKLAHOMA COLLEGE FOR WOMEN**, at Chickasha, Grady County, Okla., founded in 1908, is state controlled. It received its present title in 1916. The college is operated through funds appropriated by the State Legislature. Its buildings were valued in 1931 at \$2,000,000. There were 18,000 volumes in the library. In 1931-32 there were 875 students enrolled and a faculty of 60, headed by Pres. MELL A. NASH.

**OKMULGEE**, a city and the county seat of Okmulgee Co., situated in eastern Oklahoma, 46 mi. south of Tulsa. Bus lines and two railroads serve the city. There is an airport. Okmulgee is surrounded by highly productive oil and gas fields, as well as good farming and stock-raising country. The city is a center for the oil and gas interests in this region and has large refineries and factories making oil field equipment. Glass and various other products are manufactured with profit. In 1929 the factory output reached an approximate total of \$5,000,000; the retail trade amounted to \$11,982,939. Okmulgee was founded about 1900, and incorporated 1912. The old Council house, once the capitol of the Creek Indian nation, stands in the center of the city. Pop. 1920, 17,430; 1930, 17,097.

**OKRA** (*Hibiscus esculentus*), called also gumbo, a vigorous annual of the mallow family widely grown in tropical and subtropical countries as a vegetable. It is native to tropical Africa where its cultivation dates back many centuries. The plant, which is of easy culture, grows usually from 1 to 6 ft. high, bearing broad heart-shaped leaves, often a foot across, and a long, many-ribbed fruit pod, more or less woody when ripe. The soft, fleshy, immature pods, which contain much mucilaginous matter, are widely used for thickening soups. Okra, widely grown in the southern states, finds its way into many northern markets.

**OKUMA, MARQUIS SHIGENOBU** (1838-1922), Japanese statesman, was born at Saga, Hizen. He was trained for a political career and was a member of the inner group of political leaders for many years, beginning in 1869. In 1881 he organized the Progressive party to work for a constitutional government which he helped to inaugurate in 1890. Under this régime he served as Minister of Agriculture and Commerce in 1896-97, and as Prime Minister in 1914-16. He founded Waseda University at Tokyo and aided the cause of women's education in Japan. He died at Tokyo, Jan. 9, 1922.

**OKWANUCHU**, a North American Indian tribe speaking a dialect closely related to Shasta, but containing some entirely distinct dialectic elements. They inhabited formerly the Upper McCloud River to

Salt Creek and the Upper Sacramento River to Squaw Creek and its valley, in California, but are now extinct.

**OLAF**, the name of five Norwegian kings. Olaf Trygvesson (c. 969-1000), after a boyhood spent in adventurous exile, became leader of a Viking fleet raiding the coast of England, where he was converted to Christianity. In 995 he returned at the head of a small fleet to Norway, and there, following the murder of Haakon Jarl, proclaimed himself king of the country. He forced the adoption of Christianity on his subjects, and founded Nidaros (Trondheim) as the capital city. Olaf II Haraldson (995-1030), wrested Norway, in 1015, from the Danish and Swedish rulers who had held it since 1000, and made himself king. In 1028, petty rulers he had conquered, aided by Canute the Great, king of Denmark, forced Olaf to flee from Norway. Two years later he returned with an army, that was defeated and he was killed in a battle with Canute. His work in spreading the Christian religion and activities in Norway was later appreciated. He was canonized in 1164, and became the patron saint of Norway. Olaf III: (1066-1093), surnamed the Tranquil, was the son of Harald Hardrada. In 1066 he became joint king with his brother, and at the latter's death in 1069 ruled alone. His reign was peaceful and prosperous. He founded the city of Bergen. Olaf IV (r. 1103-1116), son of Magnus Barefoot, shared the throne with two brothers in an uneventful reign. Olav V (1370-1387), was the son of Haakon VI and Margaret, celebrated daughter of Valdemar, king of Denmark. He was elected king of Denmark in 1376, and in 1380 succeeded his father to the Norwegian throne, thus commencing the union of two countries which lasted more than four centuries. Throughout the boy's reign, his domain was governed by his mother and a council of regency.

**OLD AGE.** In the United States and most countries of western Europe the proportion of persons in the older age groups has been increasing rapidly for several decades and the proportion in the younger age groups declining. This aging process in the population is likely to continue at an accelerated speed. It is a result of the decreasing rate of population growth, which is caused by the birth rate falling more rapidly than the death rate and also, in the United States, by the restriction of immigration.

PERCENTAGE OF THE POPULATION OF THE UNITED STATES IN SPECIFIED AGE PERIODS

Age in Years	Whites				Negroes			
	1870	1900	1930	1960*	1870	1900	1930	1960*
0-19 . . . .	49.2	43.6	39.0	32.7	53.6	51.3	44.2	38.9
20-39 . . . .	30.4	32.2	31.1	30.6	29.2	30.9	32.0	32.0
40-49 . . . .	9.3	10.5	12.1	13.1	7.9	7.8	10.5	11.2
50-59 . . . .	6.0	7.0	8.9	10.5	4.9	5.3	7.5	8.8
60-69 . . . .	3.3	4.2	5.6	7.7	2.8	3.0	3.8	5.6
70-79 . . . .	1.4	1.9	2.6	4.2	1.1	1.2	1.6	2.6
80 and over . .	.4	.6	.7	1.2	.5	.5	.4	.9

\* Prediction of the Scripps Foundation.

**Dependency and Old Age.** When most families lived on their own farms in the United States there

was little old age dependency, for it was not difficult nor costly to fit an old person into the self-sufficient farm economy of those times. With the growth of industry and the movement to cities, there is less opportunity for older persons to work, or for their food to be grown at home. Furthermore, families are smaller, so that parents have fewer children to support them in their declining years. These developments, together with the increasing proportion of elders in the population, have caused the number of dependent aged to mount much more rapidly than the total population.

**Early Methods of Care.** In the past the poorhouse was the final abode of most of the indigent aged without relatives or friends to support them. While some of these institutions had adequate buildings and gave their inmates decent care, the situation in the majority was unsatisfactory and frequently disgraceful. Religious, fraternal and other organizations for many years have provided good homes for the aged, open to dependent members; but these have accommodated only a small proportion of the indigent aged. Government homes have been available to army and navy veterans.

**PERCENTAGE OF PERSONS 65 OR OLDER HAVING INCOMES OF SPECIFIED AMOUNTS**

Annual Income	Northeast- ern States	United States
No income . . . . .		15
\$ 1 to \$ 299 . . . . .		20
300 to 999 . . . . .	25	35
1,000 to 1,999 . . . . .		20
2,000 or more . . . . .	14	20

Statistics of the extent of dependency among older people and of their incomes are inadequate. The results of investigations in certain northeastern states, mostly among city people, are given in the accompanying table, together with estimates for the United States as a whole. Between 15 and 20% of the old people have no income and are supported entirely by relatives or friends, or by public or private charitable institutions. About 20% have incomes of less than \$300 and are either partially supported from these sources, or are living in penury. P. K. W.

**BIBLIOGRAPHY.**—W. S. Thompson, *Population Problems*; J. L. Gillin, *Poverty and Dependency*.

**OLD AGE INSURANCE.** See PENSIONS, OLD AGE.

**OLD AGE PENSIONS.** See PENSIONS, OLD AGE.

**OLD BAILEY, THE,** the popular name for the Central Criminal Court of London, England, in Old Bailey Street, near St. Paul's Cathedral. The original Old Bailey, which burned down in 1780, was a prison of gruesome reputation, as is attested in Defoe's *Moll Flanders* and Dickens's *Tale of Two Cities*. It was so named from having been built on the site of an ancient Roman rampart (*vallum*: becoming *ballium*, hence *Bailey*).

**OLD CATHOLIC CHURCH IN THE UNITED STATES.** This Church represents the Old Catholic movement in Europe consequent to the

Council of the Vatican in 1870, which affirmed papal infallibility. There are three groups of Old Catholics, organized under the names of (1) Old Roman Catholic Church, chiefly found in Massachusetts and Illinois, with an aggregate of about 6,000 members, the chief language used being Polish, although Lithuanian, Russian, Portuguese and English are also used; (2) the American Catholic Church, the smallest of the groups, which is chiefly located in Pennsylvania, Illinois and Florida; and (3) the Catholic Church of North America, which has the largest membership, upwards of 10,000, principally located in Illinois, where the headquarters at Waukegan is ruled by a bishop consecrated by the Jansenist churches of Belgium. The services of the last named church are mostly in English, only a few being in other tongues. These churches accept the doctrines of the seven ecumenical councils of the universal and undivided church prior to 1054, rejecting the doctrine of the *filioque*, papal supremacy and infallibility, and all union of Church and State. Of similar character, although not ecclesiastically connected, are the Polish National Catholic Church of America and the Lithuanian National Catholic Church.

**OLD CONNECTICUT PATH,** a famous Indian trail whose termini are the present Boston and Albany; Wayland, Worcester, Oxford, and Springfield lie along its course. The route was established as a permanent thoroughfare by the General Court of Massachusetts after New Amsterdam had come into possession of the English. The Boston and Albany Railway follows its general alignment.

**OLD DOMINION, THE,** or The Ancient Dominion, the state of Virginia. The origin of the name has been as follows: Captain John Smith is said to have called Virginia "Old Virginia" in contrast to "New Virginia" which was applied to New England. Virginia was often officially called "the Colony and Dominion of Virginia." A combination of the two resulted in the name "the Old Dominion."

**OLDEN BARNEVELDT, JOHANN VAN** (1549-1619), Dutch statesman, was born at Amersfoort in 1549. He left his law practice at The Hague in 1570 to join the army against the Spaniards. After the death of William the Silent he guaranteed the independence of the Netherlands by alliances with England and France, and even headed a deputation which offered the sovereignty of his people to Queen Elizabeth. He was advocate-general of the province of Holland, and, as the leader of the Republicans, opposed Maurice of Orange, who had monarchic ambitions. He saved the territory from the ravages of the THIRTY YEARS' WAR by an agreement with Spain in 1609. Barneveldt then headed the Remonstrants, who believed in free will, against Maurice and the Contraremonstrants. Saying that Barneveldt's party was in league with Spain, Maurice had Barneveldt arrested, thrown into prison and tried for treason. He was executed on May 13, 1619.

**OLDENBURG,** German free state consisting of three separate territories: the former duchy of Old-

enburg, 2,064 sq. mi., 442,027 inhabitants, on the German Ocean; the former principality of Lubeck, 209 sq. mi., 47,494 inhabitants, in eastern Holstein; and the former principality of Birkenfeld, 195 sq. mi., 55,649 inhabitants, northwest of the Bavarian palatinate entirely surrounded by the Prussian Rhine province.

Oldenburg proper and Lubeck are agricultural districts. Birkenfeld is cultivated in small farms and it has industries engaged in the cutting of agate and precious stones, goldsmith and metal work. The Oldenburg dynasty intermarried with the rulers of Holstein and their descendants became kings of Denmark, dukes of Schleswig-Holstein, and, through Peter III, Czars of Russia. Oldenburg became a free state in 1918.

**OLDENBURG**, capital of the German state of Oldenburg, located on the Hunte and connected with the Ems-Hunte Canal. It has a small inner city and extensive new districts with fine gardens in place of the demolished city walls. There are several churches, a former ducal palace with gardens, a Gothic rathaus, fine art galleries and museums. The city has a number of factories, deals in grain and horses and engages in oversea and interior shipping. Pop. 1925, 52,723.

**OLD FORGE**, a borough in Lackawanna Co., northeastern Pennsylvania, situated on the Lackawanna River, 6 mi. southeast of Scranton. The Erie and the Lackawanna railroads serve the city. Anthracite coal mining is the chief industrial interest. The retail trade in 1929 amounted to \$1,939,510. Old Forge was founded in 1830 and became a borough in 1899. Pop. 1920, 12,237; 1930, 12,661.

**OLD GLORY**, another name for the flag of the United States; also used colloquially of the United States. It is also a nickname given to Sir Francis Burdett (1770-1844), an English politician, who for many years led the Radical party.

**OLDHAM**, a town of Lancashire, England, situated on the Medlock, six mi. northeast of Manchester. In 1760 it was a small village, and owes its growth chiefly to its proximity to coal mines and the extension of its cotton manufactures. The staple industries are the spinning and weaving of cotton in about 300 mills, which consume approximately one-fifth of the total British imports of cotton; there are also several large bleach works, silk factories, tanneries and roperies. Oldham has several imposing public buildings; the town hall, 1841, is a splendid edifice in the Greek style. Alexandra Park of 72 acres is beautifully laid out. Pop. 1921, 144,983; 1931, 140,309.

**OLD HICKORY**, a popular nickname for ANDREW JACKSON, seventh President of the United States. Because of the vigorous part he had played in the Battle of New Orleans, 1813, Jackson was at first known as "tough," and this was changed to "Tough as Hickory," then to "Hickory," and finally to "Old Hickory."

**OLD KASAAN**, a national monument situated on Prince of Wales Island, off southeastern Alaska. A

tract of 38 acres was set aside Oct. 25, 1916 and placed under the administration of the Department of Agriculture to preserve an old and abandoned village of the Haida tribe of Indians. Totem poles, grave houses and portions of the wooden framework of the original building remain. Old Kasaan is reached by steamship from Seattle via Ketchikan.

**OLD LADY OF THREADNEEDLE STREET**, an expression for the Bank of England, so called from its location on Threadneedle Street in London. The name Threadneedle probably arose from the three needles on the escutcheon of the Needlemaker's Co., or the hall of the Merchant Tailor's Co. in this street. John Gilray, in 1797, was thought to be the first to use the expression in caricaturing the conservatism of the bank.

**OLD MAN OF THE MOUNTAINS, THE**, the title (*Shaykh-al-Jabal*) of the ruler of the Assassins, a secret order of Islam founded in about 1090 by Hassan ben Sabbah. Until the 13th century the Assassins, with their secret assassinations, held Persia and Asia Minor in terror. The Old Man of the Mountains is also a natural rock formation shaped like a colossal human profile, on Mt. Cannon in the Franconia range, New Hampshire.

**OLD MAN OF THE SEA, THE**, in the ARABIAN NIGHTS, a monster which fastened itself on the back of Sinbad the Sailor and clung there for several days, until it was made drunk by Sinbad and shaken off. The phrase is used figuratively of any wearisome, oppressive burden.

**OLD MORTALITY**, one of Sir Walter Scott's finest historical novels; published 1816. This work, in the first series of the *Tales of My Landlord*, gives an exceptionally vivid picture of the skirmishes between the Covenanters and the Cavaliers which marked the years 1679-90 in Scottish history. The story proper deals with two lovers, Henry Morton and Edith Bellenden, whose love, after numerous adventures, ends happily in marriage after the death of Edith's fiancé, Lord Evansdale. Important minor characters are Balfour of Burleigh, a fanatic; Grahame of Claverhouse, scourge of the Covenanters; and the Rev. Mr. Poundtext, an ardent Presbyterian preacher.

**OLD NORSE LITERATURE**, a body of writings in the Old Norse language, forming a literature which came to an end early in the 14th century with the decline of Norway as a sovereign state. See DANO-NORWEGIAN LITERATURE; ICELANDIC LITERATURE.

**OLD POINT COMFORT**, a prominent winter and summer resort in Elizabeth City Co., Va. It is situated on a sandy neck of land where Hampton Roads joins Chesapeake Bay at the mouth of the James River, 12 mi. northeast of Newport News. The town is accessible by railroad, automobile and water routes. A delightful climate, picturesque scenery and the attractive opportunities for bathing, boating, fishing and other recreations have made Old Point Comfort one of the leading health and pleasure resorts of Virginia. At Old Point Comfort is located Fortress Monroe and the Coast Artillery School.

**OLD SALEM PARK**, a state park located at New Salem in west central Illinois, near Petersburg. Created in 1919 and comprising 80 acres, the park contains the site of the village where Abraham Lincoln lived as a young man from 1831 to 1838. The village is being restored.

**OLD TOWN**, a city in Penobscot Co., southern Maine, situated on Marsh Island in the Penobscot River, 12 mi. northeast of Bangor. It is served by river craft and two railroads. Potatoes and truck crops are raised in the vicinity. The chief local manufactures are patent medicine, canoes, and wool and lumber products. Near by, on Indian Island, is a settlement of Penobscot Indians maintained by the State. Abbé Louis Pierre Thury came here as a missionary in 1687. John Marsh bought Marsh Island about 1774. Old Town was incorporated in 1840 and became a city in 1891. Pop. 1920, 6,956; 1930, 7,266.

**OLD-WITCH GRASS** (*Panicum capillare*), a small annual of the grass family called also ticklegrass and tumble-weed. It is commonly found in dry soils, especially in cultivated fields, from Nova Scotia to Florida and westward to North Dakota and Texas. The plant grows 1 or 2 ft. high with hairy stems, narrow leaves and very numerous minute flowering spikes borne on long hairlike stalks. The large flowering panicle, usually about a foot long, breaks off at maturity and is blown about as a tumble weed.

**OLD WIVES' TALE, THE**, a realistic novel by ARNOLD BENNETT; published 1908. Laid chiefly in Bursley, England, this work chronicles the lives of two sisters, Constance and Sophia Baines, daughters of a middle-class draper. Constance is married to her father's assistant, and lives out her life at home, meeting the demands of her restricted life sometimes weakly, sometimes admirably. The romantic Sophia, revolting against the conventionality of Bursley, elopes with a traveling salesman to Paris, where she is soon deserted. She becomes the proprietress of a pension; disillusioned, yet financially successful, she at last returns to Bursley.

**OLEAN**, a city of southwestern New York, in Cattaraugus Co., situated on the Allegheny River at the mouth of Olean Creek, about 70 mi. south of Buffalo. Transportation facilities include the Erie, the Pennsylvania, and the Pittsburgh, Shawmut and Northern railroads, bus lines and airports. Olean is situated on a level plateau about 1,450 ft. above sea level, in a district rich in natural gas and oil. Among the leading manufactures are petroleum products and machinery. In 1929 the industrial output was worth \$21,427,469. The retail business in 1929 reached a total of \$15,493,243. Olean is the chief distributing point for huge quantities of oil, piped here from the Pennsylvania fields, and from here to other cities. Near by is a strange geological formation called Rock City, consisting of immense rocks, many of them pure white, in regular formation. Also near by is the oil spring where, it is said, the white man first discovered petroleum. Settled in 1804 by Major Adam Hoops

and David Heuston, the town was originally called Hamilton, but was renamed in 1817, probably in allusion to the oil springs. In 1893 Olean was incorporated. Pop. 1920, 20,506; 1930, 21,790.

**OLEANDER** (*Nerium Oleander*), a handsome ornamental evergreen shrub of the dogbane family, native to the Mediterranean region and extensively cultivated and naturalized in many parts of the world. It grows from 6 to 20 ft. high bearing long, narrow, dark green leaves, large white, red or purple, often double flowers, sometimes 3 in. across, and long slender fruit pods in groups of two. All parts of the plant are highly poisonous.

**OLEASTER** (*Elæagnus angustifolia*), a handsome ornamental shrub or small tree of the oleaster family native to Europe and western Asia, several varieties of which are widely cultivated. It grows sometimes 20 ft. high, with more or less spiny branches, silvery-white branchlets, narrowly oblong leaves, silvery beneath, fragrant yellow flowers, and oval silvery-scaly fruit.

**OLEFINE COMPOUNDS**, that group of unsaturated aliphatic HYDROCARBONS having the empirical formula  $C_n H_{2n}$  and suffix *-ene*. The characteristic ethylene bondage is represented by a double bond

$$\begin{array}{c} | \qquad | \\ -C = C- \end{array}$$

between two adjacent carbon atoms, as  $-C = C-$ . ETHYLENE,  $H_2C = CH_2$ , from which it derived its name, is the first member of the unsaturated hydrocarbon series. Two or more ethylene bonds may be in the same molecule. Groups like  $-OH$ ,  $-NH_2$ ,  $CO_2H$ , etc., may be combined with the unsaturated molecule, thus extending the olefine compounds over the whole field of organic chemistry. From the branched carbon chains and different positions of the double bonds, the number of possible isomers is very large. They are widely distributed in nature, in both animal and vegetable kingdoms. Many olefinic compounds are found in coal tar and petroleum distillates. Preparation of individual compounds is governed by the presence of other groups in the molecule. Due to their unsaturation, the aliphatic olefinic compounds are very reactive chemically, combining readily with halogens and halogen hydrides to form saturated halogenated compounds. ISOPRENE, linoleic acid, butadiene, etc., have two ethylene linkages. Benzene is usually represented by three ethylene linkages but the ring structure gives it and its derivatives quite different properties. Geraneol, citronellol and oleic acid belong to the olefine compounds. J. E. C.

**OLEIC ACID**, one of the three principal fatty acids occurring in oils and fats, and by far the most important one of the group of acids derived from the unsaturated chain hydrocarbons. Its chemical formula is  $CH_3(CH_2)_7CH = CH(CH_2)_7COOH$ , the "double bond" between the two carbon atoms in the center indicating its degree of unsaturation; if two more hydrogen atoms can be added here, it becomes stearic acid. The glyceride, or ester, formed by combination with glycerine, often called simply olein, is an important constituent of oils—olive oil containing as

much as 72 per cent. Sodium and potassium oleates form part of many soaps. Lead oleate, insoluble in water, but soluble in ether, is the lead plaster used in medicine.

**OLEOMARGARINE**, the firm, fatty, edible product resulting from the mixture and working of various animal or vegetable fats and oils, with or without added coloring matter. As defined by Congress, oleomargarine includes: all substances known as oleo, oleomargarine oil, butterine, lardine, suine, and neutral, or their mixtures; all lard extracts and tallow extracts; all mixtures and compounds of tallow, beef fat, suet, lard, lard oil, fish oil or fish fat, vegetable oil, annatto and other coloring matter—(1) if made in imitation or semblance of butter, or (2) calculated or intended to be sold as butter or for butter, or (3) churned, emulsified, or mixed in cream, milk, or other liquid and containing salt or more than one per cent of water.

The production of oleomargarine in the United States in 1930 was approximately 326,000,000 lbs., of which about 95% was uncolored and the remainder colored. Per capita consumption of oleomargarine in 1930 was 2.64 lbs. These figures are representative of the production and consumption of the product in recent years.

J. R. M.

**BIBLIOGRAPHY.**—U.S. Dept. of Agriculture Yearbook, 1930; An Act to amend the definition of Oleomargarine, 71st Congress, second session, 1929.

**OLEORESINS.** In nature, the oleoresins are mixtures of an essential oil and a resin, forming the various vegetable balsams. In pharmacy they are fixed or volatile oils, having resin and sometimes other active matter in solution, and are obtained by the evaporation of ether tinctures. Many of the oleoresins are of importance in medicine, including those of the male-fern (*Aspidium*), ginger, lupulin, iris, cubeb, caspium and black pepper. Oleoresin of male-fern is a greenish liquid used as an anthelmintic. Oleoresin of black pepper is about the same as oil of black pepper.

**OLIGARCHY.** See GOVERNMENT.

**OLIGOCENE EPOCH**, the second subdivision of the Tertiary Period in the CENOZOIC ERA of geological history.

**OLIGOCLASE**, a light-colored FELDSPAR of the PLAGIOCLASE group, consisting of a mixture of about three parts of albite to one of anorthite. Particularly attractive varieties are used as GEM STONES under the names MOONSTONE, and Sun Stone or AVENTURINE.

**OLIPHANT, MRS. MARGARET WILSON** (1828-97), British novelist, was born in Wallyford, Scotland, Apr. 4, 1828. She grew up in Glasgow and Liverpool, receiving her education privately. She contributed to *Blackwood's Magazine* and published her first book in 1849. After her husband's death ten years later she turned to writing to support herself and her three children. Under the name, Mrs. Oliphant, she published 120 books—novels, histories, biographies—all popular at the time. *The Chronicles of Earlingford*, 1863-76, a collection of short stories, is

generally considered the best of her fiction, and *Adam Graems*, 1852, and *Miss Majoribanks*, 1866, are interesting novels. Mrs. Oliphant's *Autobiography* tells the story of her life. She died in Wimbledon, England, June 25, 1897.

**OLIVA, TREATY OF**, an agreement between Poland and Sweden, signed on May 3, 1660, at the town of Oliva, five miles northwest of Danzig, after the Swedes lost their leader Charles X, and retreated to the sea pursued by King John Casimir of Poland. By the terms of the treaty, to which Prussia was also a party, the Polish king renounced his claim to the Swedish throne, and ceded Livonia and Esthonia to Sweden.

**OLIVE** (*Olea europaea*), a valuable economic tree of the olive family cultivated since remote antiquity for its fruit, the source of olive oil. It is a native of the Mediterranean region, widely grown in warm dry countries. The cultivated olive grows sometimes 25 ft. high, bearing round thornless branches, narrow leaves, which are dark green above and silvery-scaly beneath, white fragrant flowers in small clusters and an oblong fleshy black fruit (drupe) containing a bony stone. Olive oil expressed from the seeds, known in medicine as sweet oil, has long been an important article of food and commerce. Pickled olives, the unripe fruit preserved in brine, a favorite table delicacy since Roman times, have been discovered among the stores buried in Pompeii. Centuries of cultivation have produced numerous varieties, as the noted Licinian olive of Italy and the broad-leaved olive of Spain. The wild olive found in most Mediterranean countries has four-angled thorny branches, broader leaves and much smaller fruit.

The cultivation of the olive was carried on by the ancient Egyptians; Homer mentions it in the *Iliad* and in the *Odyssey*, and the *Bible* contains numerous references to it, the earliest occurring in Genesis. According to Pliny, the Romans acquired the cultivated olive at the time of Tarquin, 627 B.C. Among the ancient nations of southern Europe the olive became an emblem symbolic not only of peace, but also of national wealth and domestic prosperity. In Greece, a wild olive spray was the winner's badge in the Olympic games, and in Rome the olive crown distinguished the victor in war. In California olive growing was established by Spanish missionaries about 1770; the state is now the foremost producer of olives in the United States. According to the Census of 1930 the yield for 1929 was 41,610,000 lbs.

A. B. J.

**OLIVEIRA LIMA, MANOEL DE** (1867-1928), Brazilian historian, was one of the most distinguished writers of his country and served as a representative of Brazil at many foreign courts. He remained a monarchist in sympathy long after the republic had been proclaimed. He collected a vast library on Latin America which he donated to the Catholic University in Washington, D.C., where he lived in the latter years of his life. He was an indefatigable lecturer on Brazilian life and history. Among his better known works are his excellent biographical

study, *Dom Joao VI do Brasil* and his *The Evolution of Brasil*, compared with that of Spanish and Anglo-Saxon America, the latter being a series of lectures he delivered at Stanford University in English. Before the University of Paris he delivered the lectures found in his *Formation historique de la nationalité Brésilienne*. He was also one of the editors of a Portuguese encyclopaedia. Oliveira died in 1928.

**OLIVENUT**, the stony seed of the plumlike fruit of various species of *Elaeocarpus*, a large genus of tropical trees. The hard stones of *E. Ganitrus*, a small tree native to India, are commonly used for making necklaces, heads of pins and similar articles. The pulp surrounding the nut of several species is used in curries and pickles.

**OLIVER OPTIC.** See ADAMS, WILLIAM TAYLOR.

**OLIVER TWIST**, a novel by CHARLES DICKENS; published 1838. This story depicts all the horrors of life among the poor and criminal classes of early 19th century London. The hero is an orphan who, running away from the workhouse, wanders to London



OLIVER ASKING FOR MORE

Drawing by George Cruikshank for Dickens' "Oliver Twist"

and there meets a hardened youth, the "Artful Dodger," who leads the innocent Oliver to a school for pickpockets, maintained by a villainous Jew, Fagin. The lad is rescued from Fagin by the kindly Mr. Brownlow, but is enticed away again by Nancy, the friend of Bill Sykes, a housebreaker. Bullied into obedience by Sykes, Oliver breaks into the house of the Maylies, is shot in a scuffle, and is then cared for by these benevolent folk, who become his friends. In the end Oliver discovers in the Maylies' adopted daughter, Rose, his own long-lost sister; Fagin, Bill Sykes and the "Artful Dodger" are all brought to justice; and the hero is finally adopted by Mr. Brownlow.

**OLIVES, MOUNT OF**, or Mount Olivet, mentioned in the New Testament in connection with the last days of the life of Jesus. This hilly ridge faces Jerusalem on the east and is separated from it by the Kidron. On the northern extension of the ridge is the new Hebrew University, formally dedicated by Balfour in 1925. An earthquake in the vicinity of Mt. Olivet caused considerable damage in 1927. Mt. Olivet is the site of a number of churches and monasteries belonging to various religious sects.

**OLIVETANS**, or Order of Our Lady of Mount Olivet, a Benedictine order founded in 1319 by St. Bernard Ptolomei on a mountain near Siena which they called Monte Oliveto. The constitutional reforms of this congregation led to the great Cassinese reform of the Benedictine Order in the 15th century. At one time the Olivetans had 83 houses in France and Italy. There are now 17 establishments in Italy, France, Syria and Brazil, and nearly 400 religious, excluding novices and lay brothers.

**OLIVINE**, a rock-forming silicate of dark yellowish green to olive green color, whence the name. **CHRYSO-LITE** is another name for the same mineral, called also **PERIDOT** when of gem quality. Crystals and grains of olivine, commonly found disseminated in igneous rocks, are usually opaque to translucent. Olivine crystallizes in the **ORTHORHOMBIC SYSTEM**. Chemically it is an iron-magnesium silicate.

Olivine occurs as an important constituent in such rocks as peridotite, norite, basalt, gabbro and diabase. It may increase in amount, however, until it forms almost the sole mineral, as in the dunites. It is also found in metamorphic rocks formed from sediments high in magnesia and iron, as the impure dolomites. Olivine is widely distributed, the Vesuvius lavas and some of the New England States being noteworthy localities. Gem varieties come from Egypt. See also **SERPENTINE**; **TALC**; **GEM STONES**; **PETROLOGY**.

**OLM** or **PROTEUS**, common names for a species (*Proteus anguinus*) of blind cave-dwelling amphibian found in cool underground Alpine waters. It has an eel-like body about a foot long, with four short legs. The head is pointed, the skin flesh-colored or whitish, and the branched external gills blood red. If an olm is taken from its dark home and kept in white light it soon becomes blackish, and if the young are brought up under red light they develop functional eyes. The eyes do not develop under white light but are soon overlaid by black pigment. There is also some reason to believe that under natural conditions the young are born alive, although in captivity the female lays eggs.

**OLMEDO, JOSÉ JOAQUIN** (1780-1847), South American poet, was born in 1780 in Guayaquil, which was at that time in the Vice-Royalty of Peru. He received a classical education at the University of San Marcos, Lima. When Guayaquil became a part of Ecuador, Olmedo took part in the politics of the stirring revolutionary period. He was sent by Guayaquil in 1811 to the Spanish Cortes at Cadiz, and there played a prominent rôle in the revolu-



tionary activities of that body. He came back to America in 1816, but was soon named by Bolivar to represent Colombia in London. Here he became intimately associated with ANDRES BELLO. To the end of his life, in 1847, Olmedo enjoyed high political favor in his country. He is considered by the literary historians of the epoch as a neo-classic of the school of Quintana; though writing of Spanish-American heroes and the achievement of independence by the Colony, he still leaned upon the mythology of the ancients. His fame rests upon the Ode, *La victoria de Junin*, which is a glorification of Bolivar. Other of Olmedo's poems to retain favor in the anthologies are *Canto al General Flores*, later the target for the poet's poisoned shafts, and *A un amigo en el nacimiento de su primogenito*, verses to the first born of a friend.

I. G.

**OLMSTED, FREDERICK LAW** (1822-1903), American landscape architect, was born in Hartford, Conn., Apr. 27, 1822. After leaving Yale, he continued his study of landscape gardening and agricultural methods in the United States and Europe. In 1856 as superintendent of the New York Central Park Commission, he was mainly responsible for the designing of Central Park. As a result of this work he was engaged in most of the important park planning in America—Prospect Park, Brooklyn; Fairmount Park, Philadelphia; South Park, Chicago; Riverside, New York City, among others. He was one of the founders of the Metropolitan Museum of Art and the American Museum of Natural History, New York City. During the Civil War he was secretary of the United States Sanitary Commission. He was appointed first commissioner of the Yosemite National Park. He died Aug. 28, 1903.

**OLMÜTZ.** See OLOMOUC.

**OLNEY, RICHARD** (1835-1917), American statesman, was born at Oxford, Mass., Sept. 15, 1835. He graduated from Brown University, 1856 and from the Harvard Law School, 1858. He was admitted to the Massachusetts bar, 1859 and began the practice of law in Boston. He soon gained a reputation for brilliance as a lawyer, especially in corporation cases, which extended beyond his own state. He acted as counsel for a number of large railroads and corporations. He several times refused the proffered appointment of judge of the Massachusetts supreme court, although for one term he served as a Democrat in the Massachusetts legislature, 1874. President Cleveland in 1893 appointed him attorney-general of the United States, and it was Olney who advised the President in 1894 to utilize the legal injunction in the Pullman strike at Chicago to put an end to the violence and disorder. He contended that the carriage of the mails had to be protected and facilitated by the national government, and he successfully defended his theory before the Supreme Court in 1895 in proceedings as to the validity of the six months' sentence of Eugene V. Debs for violation of the injunction.

Olney, as Secretary of State, 1895-97, handled the critical negotiations between England and the United

States about the Venezuela boundary controversy in which he with Cleveland's support asserted that the Monroe Doctrine warranted United States interference in disputes between American and European nations. He resumed law practice in Boston, 1897, and died in that city, Apr. 8, 1917.

**OLNEY**, a market town on the River Ouse, in Buckinghamshire, England. Pop. about 2,700. It is famous as the home from 1767 to 1786 of the poet WILLIAM COWPER and his friend, Mrs. Mary Unwin. While living at Olney the poet wrote with John Newton the *Olney Hymns*, 1779, and there were written also *The Task*, *The Royal George*, *John Gilpin* and other poems. In 1900 the Cowper house was made a museum.

**OLNEY**, a city in southeastern Illinois, the county seat of Richland Co., situated about 120 mi. east of St. Louis. It is served by bus lines and two railroads. Red top seed, poultry, fruit raising and dairying are the leading interests of the district. The chief local manufactures are shoes, underwear and vinegar. Olney was founded in 1841 and incorporated in 1867. Pop. 1920, 4,491; 1930, 6,140.

**OLOMOUC** (German *Olmütz*), a city in Czechoslovakia, on the Morava River about 15 mi. west of Lipnik. The razing of the old city walls has provided room for many fine promenades and parks. There are two extensive squares and among the churches are the 14th century cathedral of St. Wenceslaus, St. Maurice's Church of the 11th and 12th centuries, the Dominican and St. Michael's Church, the Protestant church and the Jewish temple. Noteworthy are also the archiepiscopal residence, the cathedral chantry, the city hall with a fine portal, a chapel now used as an historical museum, a library and trade museum. The chief manufactures are beer and malt, metal goods, food products and leather. The trade is largely in grain, malt, sugar, cattle and cheese. Olomouc was the seat of various Slavic princes and kings. The bishopric was founded in 1063. The bishop was chosen by the Bohemian king with the assent of clergy and people, consecrated by the Archbishop of Mainz and invested by the German emperor. Later the bishop became prince-bishop with secular power and was made archbishop in 1777. Of the population over two-thirds are Czechs and the rest are Germans. Pop. 1930, 65,989.

**OLONA** (*Touchardia latifolia*), an erect shrub of the nettle family found only in the Hawaiian Islands, where it has been cultivated for many centuries by the native people. From the bark of the young branches is obtained a fiber which ranks among the strongest yet discovered. The tensile strength of olona fiber is rated at about 8 times that of ordinary hemp and at about 3 times that of the finest grades of abaca. Besides its remarkable pliability, being readily woven by simple means into cloth and cordage, it displays unusual durability in water. Because of this extraordinary quality, fishing nets fabricated from olona are said to be effective after a hundred years of use.

**OLTEN**, a city of Switzerland, in the canton of Solothurn on both sides of the Aare River. Noteworthy buildings are the City Church, Capucin abbey, city hall, museum with interesting collections and library. The chief products are machines, motor vehicles, soap, footwear and felt and there is a brisk trade. Pop. 1930, 13,555.

**OLYMPIA**, the capital city of Washington, and the county seat of Thurston Co., western Washington, situated as an inland port on the southernmost arm of Puget Sound, 33 mi. southwest of Tacoma. Two railroads, steamers and bus and truck lines serve the city. There is an airport. Olympia is a shipping point for oysters, agricultural products and a great amount of lumber. Harbor traffic, 1930, not including lumber, was 471,625 tons, worth \$7,408,024. The chief local industries comprise lumber products, veneer and paper factories, knitting mills and fruit and vegetable canneries. In 1929 the retail trade was worth \$9,311,999.

With a few followers Michael T. Simmons, from Kentucky, settled a mile south of the present city in 1846. The gold rush in 1849 lured all the men away, but the return of a few on a brig which later transported the first lumber from this region, marked the beginning of Olympia's commercial career. The city was chartered in 1859. Handsome state buildings occupy a promontory projecting into the sound. The setting of Olympia is unusually beautiful. On the south is the canyon of the Deschutes River, on the east, Mt. Rainier, and in the distance, on the north are the Olympic Mountains. Pop. 1920, 7,795; 1930, 11,733.

**OLYMPIAD**, the four-year period between Olympic games used by the Greeks in dating events. Since the games were both numbered and named it made a satisfactory chronology if some zero game was universally agreed upon. The Olympiad was introduced by Timaeus (d. 256 B.C.) and worked out by the later Hellenistic historians. No general agreement was ever made, however, as to the date for beginning the year.

**OLYMPIC GAMES**. For over a thousand consecutive years, from 776 B.C. to 393 A.D., the Olympic Games were held in ancient Greece. Poets, historians and artists have told us their story. They constituted the one international bond which held through all wars and differences. The bloody fields of battle were for the yesterdays and the to-morrows; but peace reigned for the period of the games. The prizes were the plaudits of the world of the day and the olive wreath of victory. It was the taint of dishonesty, professionalism and commercialism which finally killed the games.

The Olympic Games of to-day, held every four years, are based on the Greek ideal of sport for sport's sake. Before competitors enter into their contests, they march into and around the appointed place behind the flags and standards of their respective countries, face the tribunal, raise their right hands and pronounce as one the Olympic oath:

"We swear that we will take part in the Olympic Games in loyal competition, respecting the regulations which govern them and desirous of participating in them in the true spirit of sportsmanship for the honor of our country and for the glory of sport."

Then the cannons boom, pigeons are let loose and fly in all directions, symbolic of the spirit of sport for sport's sake, of international good will, and sportsmanship camaraderie spreading to the four corners of the earth through the medium of the games.

**Wide Variety of Events.** Competitions are held in athletics, on track and field (*see* TRACK AND FIELD), including the Pentathlon, Decathlon and MARATHON events; SWIMMING, DIVING and WATER POLO; Cycling; Weight Lifting; FOOTBALL, rugby and soccer; BOXING; Wrestling; FENCING; Rowing; Yachting; Equestrian, riding, jumping and polo; the Modern Pentathlon, riding, running, swimming, shooting and fencing; Fine Arts, literature, sculpture and architecture. And from time to time special events or demonstrations are held. There are also winter events in which the competitions are in Speed and Figure Skating, Ski-running and jumping; Ice Hockey; Curling and Bob-sleighting.

The greatest honor that can come to anyone in the field of sport is that of becoming an Olympic champion. Officially there is no scoring for team championships. Competitors are limited as to numbers, so as to make more equality between the larger and smaller nations. The United States has been pre-eminent always in track and field athletics, swimming and diving, rowing and shooting with the rifle, revolver and shotgun. It has had its fair proportion of successes in all of the other events.

**Games Held in Different Countries.** In 1896 the first revival of the Olympic Games was held in Athens, Greece. In 1900 the games were held at Paris; in 1904 at St. Louis in conjunction with the St. Louis Exposition, but with scant success so far as foreign competition was concerned. In 1908 the games were held at London; in 1912 at Stockholm with memorable success both as to performances, good will and happy understanding on the part of contestants, officials and representatives. In 1916 the games were scheduled to have been held in Berlin, but were naturally foregone by reason of the World War. In 1920, during the aftermath of the war, the games were held in Antwerp, a most courageous and courteous act on the part of Belgium. In 1924 the games were again held in Paris; in 1928 at Amsterdam, and in 1932 in Los Angeles. The Olympic Winter Games were first held as an adjunct to the Olympic program on an indoor rink at Antwerp in 1920. In 1924 they were officially held at Chamonix in France; in 1928 at St. Moritz in Switzerland. In 1932 they were held at Lake Placid, N.Y.

The International Olympic Committee, which is a self-perpetuating, non-representative body, determines the place where the games are to be held and upon the events to be included in the Olympic program. The

International Sports Federations determine the events of the respective sports under their jurisdiction and appoint the officials thereof. The National Olympic Committees, in conjunction with the organizations in their countries representing the International Sports Federations, select and send the teams to the games. The Organizing Committees, such as at Los Angeles and Lake Placid, prepare the places of competition and act as hosts at the games. G. T. K.

**OLYMPUS**, mountains of Greece, in general all of the chain of mountains lying east of the central range of the Pindus Mountains, but specifically, the extreme eastern part of the chain forming the northern wall of the Vale of Tempe. See **OSSA**. Its highest peak, snow-capped for the greater part of the year, is 10,000 ft. high. In Greek mythology, Olympus was the home of the gods, of which Zeus, or Jupiter, was the head. The name Olympus also was applied to a hill in Laconia and to Mt. Lycæus in Arcadia, and in Asia to a chain of mountains in northwestern Asia Minor as well as to a volcano on the eastern coast of Lycia above the ancient city of Phoenixus.

**OLYPHANT**, a borough in Lackawanna Co., northeastern Pennsylvania, situated on the Lackawanna River, 6 mi. northeast of Scranton. It is served by river craft, the Delaware and Hudson and New York, Ontario and Western railroads for passenger service and by two more roads for freight service. Anthracite coal-mining is the chief industrial interest. There are iron foundries and silk mills here. In 1929 Olyphant's manufactured output was worth about \$500,000; the retail trade amounted to \$3,074,910. Pop. 1920, 10,236; 1930, 10,743.

**OMAHA**, a North American Indian tribe speaking, with the Kansa, Quapaw, Osage and Ponca, the Dhegiha dialect of the Siouan linguistic stock. They are presumed to have migrated westward from their territory on the Ohio and Wabash rivers to the mouth of the Missouri, then to Iowa, and to the district around the present Pipestone in Minnesota, whence they were driven away by the Dakota, settling on Bow River in Nebraska, and were located in the middle of the 18th century on the east side of the Missouri above Big Sioux River. By the middle of the 19th century they were on the west side of the Missouri above the Platte, but soon removed to what is now Dakota Co., Neb. They are now living on a reservation in the northeastern part of Nebraska, eking out a miserable existence on the revenues obtained from leasing their allotted lands for farming purposes, and maintaining little of their ancient life. In aboriginal days the Omaha lived, like the other tribes of the eastern Plains, in earthlodges similar to those of the Mandan or in skin-covered tipis or oval bark houses, hunting the buffalo and making some pottery and utensils of wood, horn and pottery. They maintained a gentile band organization, practicing polygamy. At present their ceremonial and social life center about the Peyote cult.

**OMAHA**, a city of eastern Nebraska, a port of entry, the county seat of Douglas Co., and the indus-

trial and commercial center of the state. It is situated on the west bank of the Missouri River, opposite Council Bluffs, Iowa, with which it is connected by bridges. The city lies on a series of terraces rising from the river. The business section is below, with the residential section on the hills and bluffs. Omaha is an important railroad center, with ten trunk railroads and several branch lines radiating from it. It is also on transcontinental air lines and has airports. Additional transportation is afforded by electric railroads, bus and motor truck lines. Transportation facilities have made Omaha a distributing point for the surrounding region. Its live stock and grain markets and its meat-packing industry are of national importance. Foundries, machine shops, smelters, flour mills, printing and publishing plants are also important and the city ranks high in the production of butter. Omaha is one of the leading wholesale and jobbing centers of the United States, with 584 organizations distributing \$698,414,841 worth of merchandise in 1929. Its manufactures, which had a total value of approximately \$350,000,000 in 1929, included clothing, shoes, food products and lumber products. During 1929, 2,702 retail stores, which did an aggregate business of \$124,519,429, gave full-time employment to 11,890 men and women. The same year the wholesale trade proper amounted to \$482,763,581. On the basis of loans granted, Omaha has the largest Federal Land Bank in the country, and is also the seat of a branch bank of the Federal Reserve System. The city was first laid out in 1854, when the Nebraska territory was first opened for settlement. It was chartered in 1857. During its early years Omaha was the territorial capital of Nebraska. Pop. 1920, 191,601; 1930, 214,006.

**OMAHA, THE MUNICIPAL UNIVERSITY OF**, located at Omaha, Neb., a coeducational, non-sectarian and privately controlled institution, was organized in 1909 as the University of Omaha. A summer school was added in 1927. In 1931 the institution became a municipal university. In 1930 there were 1,400 students, and a faculty of 20 headed by Pres. Ernest W. Emery.

**OMAN, SIR CHARLES WILLIAM CHADWICK** (1860- ), British historian, was born at Mozufferpore, India, Jan. 12, 1860. He acquired his education at Winchester and New College, Oxford, in 1883 made him a fellow of All Souls. Oxford appointed him Chichele professor of modern history in 1905 and the same year he was made a fellow of the British Academy. He was elected president of the Royal Historical Society in 1917, an office he held until 1921. He sat in parliament for Oxford in 1919 and was knighted in 1920. His best known works are: *History of the Art of War in the Middle Ages*, *History of Greece*, *A Short History of England*, *History of the Peninsular War, 1807-13*.

**OMAN**, an independent state in southeastern Arabia, comprising a strip of maritime territory along the shores of the Gulf of Oman reaching on the southwest to the deserts of the interior. The area is

about 82,000 sq. mi. The population estimated at 500,000, is composed chiefly of Arabs. The ruling sultan resides for the most part in India and Oman is practically a dependency of the government of India. There are some very fertile tracts of inland country that have rains in December and January. The coast is hot and unhealthy. Muscat is the chief town and port exporting limes, pomegranates, dried fish and dates.

**OMAR IBN AL-KHATTAB** (c. 581-644), the second Mohammedan caliph, was born about 581. He succeeded Abu Bekr in 634. At first an outstanding opponent of Mohammed, he became one of his chief supporters and advisers; Omar's daughter, Hafsa, was Mohammed's third wife. During his reign Persia, Syria, Palestine and Egypt were brought under Islam which he made a temporal rather than a religious power. He was the first to use the title Commander of the Faithful. He was assassinated in 644 by a Persian slave. The famous mosque of Omar is said to have been built in Jerusalem by his orders.

**OMAR KHAYYÁM** (?-c. 1123), Persian scientist and poet, whose full name was Ghias ud-din Abul Fath Omar Ibn Ibrahim al-Khayyám, was born probably in Nishapur, at an unknown date but probably before 1050. The name *Khayyám*, meaning "tent-maker," referred no doubt to his father's occupation. It is generally thought that he attended the famous school taught by the Imam Muaffek. A fellow student, Nizam ul Mulk, later became Vizier to the Shah Alp Arslan and granted Omar a liberal yearly pension on which to pursue his studies in mathematics and astronomy. Subsequently Omar became Astronomer Royal at Kerv. He compiled important astronomical tables known as *Zij-i-Malik-shani*, was one of the eight men who revised the Persian calendar, and wrote several works on algebra, including one on *The Difficulties of Euclid's Definitions*. While living contentedly in his native city he composed from time to time his quatrains or *Rubai'y* which have become so well known in Edward Fitzgerald's translation as *The Rubáiyát of Omar Khayyám*. Originally each quatrain was in itself a distinct poem, but in translation they have been arranged in a sequence. They are paradoxical, epigrammatic and fatalistic in their teaching that it is wisdom to "eat and drink, for to-morrow you die." In style they are simple, clear-cut, formal. The first, second and fourth lines generally rhyme, the third line being blank. The *Rubáiyát* was first published by Fitzgerald in 1859. Since then its popularity has greatly increased, and translations of it now exist in nearly all European languages. Its tone is modern, despite the fact that its author, Omar Khayyám, died, presumably in Nishapur, as long ago as 1123. See also PERSIAN LITERATURE.

**OMDURMAN**, a city of the Anglo-Egyptian Sudan, stretching for 7 mi. along the White Nile opposite Khartoum. The old Dervish capital and a center for native crafts, Omdurman is for the greater

part a mud-built town, but is one of the cleanest native cities in Africa. Est. pop. 1929, 102,983. See SUDAN.

**OMDURMAN, BATTLE OF** (1898), an engagement in the Sudan Campaigns, 1896-98, near the capital of the Anglo-Egyptian Sudan won by the British and Egyptians, under Gen. Herbert Kitchener, with an army of 23,000 over the forces of the Khalifa Abdullah numbering 30,000. At the approach of the Egyptian gunboats the Dervishes evacuated their camp at Kerreri Hill and advanced the next morning, Sept. 2, upon the Anglo-Egyptian lines. With their center squadron they attacked the British front under Macdonald which had become isolate, while their left charged the British flank and rear. This critical situation was saved by the Sudanese who changed their front under a continuous cannonade. After several hours the Dervishes retreated before the Anglo-Egyptian advance, leaving about 15,000 dead and wounded on the field. Kitchener was able to reach Omdurman in the afternoon. The victory destroyed the power of the Dervishes.

**OMEN**, a good or evil sign in connection with any system of DIVINATION.

**OMMIADS or UMAYYYADS**, a Moslem tribal faction which controlled the Caliphate from 658-750. Caliph Othman, 645-656, belonged to the Omniad House, which had originally opposed Mohammed. His partiality toward his relatives roused dissatisfaction, which culminated in the assassination of Othman and the accession of Ali, son-in-law of the Prophet. Moawiyah, governor of Syria, refused to recognize Ali. Civil war resulted in the defeat of Ali and the recognition of Moawiyah as caliph in 658. The new caliph made Damascus the Moslem capital. The Omniad caliphs were more interested in politics than in religion. They centralized the Government, placing it in the hands of a military aristocracy. Opposition was ruthlessly put down.

The Omniad period saw the greatest extension of Moslem power. In the east Arab armies reached the borders of India and China; in the west they spread the caliph's authority over Egypt, northern Africa, and into Spain. The enormous revenue produced by tribute from these conquered lands enabled the caliphs to establish a brilliant and luxurious court, where literature and the arts were encouraged and the austerities of earlier Islam forgotten. Mohammed's injunction against the use of intoxicants was neglected; the harem, with its attendant eunuchs, was introduced. Political and religious opposition weakened the Omniad dynasty. Descendants of Abbas, the Prophet's uncle, overthrew the power of Damascus and established their own candidate in the Caliphate. Members of the Omniad family were hunted down and slain. One of them, Abd-er-Rahman, escaped and made his way to Spain, where the Spanish Moslems recognized him as ruler.

**OMNIBUS BILL**, a legislative act passed in 1850 which included several compromise measures. See COMPROMISE OF 1850.

**OMSK**, administrative center of Omsk District of the Western Siberian Region of the R.S.F.S.R. Situated at the mouth of the Om River where it joins the Irtysh and on the Trans-Siberian Railway, the city is surrounded by steppes. Heavy winds summer and winter add to the unpleasantness of the climate. Established about 1717 as a fortified camp, Omsk was made the administrative center of Siberia in 1882 and expanded rapidly after the construction of the railway. Following the 1917 Revolutions it became the capital of the Siberian counter-revolutionary movement. With the establishment of the Soviet régime in 1919 the seat of administration was transferred to Novo-Sibirsk. The Regional West Siberian Museum located near the bridge which spans the Om houses a branch of the Russian Geographical Society. Dostoevsky described in *The House of the Dead* the fortress here in which he was confined from 1849 to 1853. Omsk is a commercial point of great importance, shipping quantities of hides, butter and meat. Cloth, sausage, farming implements and other items are manufactured here. Pop. 1926, 150,608.

**ONA**, a South American tribe inhabiting chiefly the main island south of the Grande River in the Tierra del Fuego group. They belong in a class with the Patagonians, or Tehuelche, though they are usually and erroneously classed with the Fuegians. On the whole they are a wretched people. They live on islands and do not use boats; they hunt only with bows and arrows and have not adopted the horse which was introduced by the Spaniards and adopted by other peoples in the region. Their language is a hard, guttural and slow-spoken speech. Due to unscrupulous treatment received at the hands of ruthless gold seekers and cattle breeders, the tribe is fast approaching extermination.

**ONEGA**, second largest lake in Europe, exceeded in size only by the Ladoga. In northwestern Russia, it covers an area of more than 3,700 sq. mi., is 150 mi. long, 50 mi. in breadth at its widest point, and has a maximum depth of 500 ft. Lying 125 ft. above sea level, it communicates with the White Sea by means of a series of lakes and rivers, and with the Gulf of Finland through the Svir River, which flows from Lake Onega into Lake Ladoga. Its largest affluent is the Vitegra. A large number of islands lie off Onega's northern shore, which is deeply indented; the southern shore is fairly regular. For more than one-half of the year the lake is free from ice and steamboats traverse its waters.

**ONE HUNDRED ASSOCIATES, COMPANY OF** (*Compagnie des Cents Associés*), 1627-63, the corporation with monopolistic rights to the development and exploitation of Canada. Richelieu created and chartered the company, upon representation (*see* RECOLLET MISSIONS) that the spread of Catholicism into New France was hampered by the Huguenots' commercial privileges. The company was awarded a perpetual monopoly of the fur trade, and a control of all other commerce, except the deep-sea fisheries, for 16 years; dominion over the immense territory from

Florida to the Arctic waters, and from the Gulf of St. Lawrence to the "Fresh Water Sea;" the right to alienate the lands, and to recommend recipients of titles of nobility. The company was bound to send to New France none but French Catholics—200 or 300 in 1628, and as many as 4,000 by 1644; it should lodge and support these colonists during three years, then, by giving them seed and cleared land or otherwise, assure their subsistence. During its first 15 years the company should support three priests, and defray the expenses of public worship.

The company encountered difficulties from the beginning, when the first four vessels sent out, leaving Dieppe in May 1628, were intercepted by the English in the St. Lawrence. The hostility of the Iroquois could not be overcome. Within a few years the company transferred its trading privileges to an association of French merchants, the *Compagnie des Habitans*. At Colbert's advice Louis XIV revoked the charter of 1627, with intention to assume direct control of New France.

**ONEIDA**, a North American Indian tribe, a member of the Iroquois confederacy. In aboriginal days their habitat was in the region south of Oneida Lake in New York, which was extended to include the upper Susquehanna River. Late in the 18th century part of the tribe migrated to Ontario, Canada, where they still live; early in the following century, another group made its way to the vicinity of Green Bay, Wis., and in 1838 these were assigned to a reservation where some 1,500 now live, citizens of the United States; the remainder have been more or less assimilated in the white population.

**ONEIDA**, a city in Madison Co., central New York, situated near Oneida Lake, on Oneida Creek, about 25 mi. east of Syracuse and west of Utica. Bus lines and three railroads serve the city. There is an airport. The countryside has good farms and dairies; the special crops are peas and alfalfa. Cigars, caskets, animal traps, period furniture, and milking machinery are important manufactures. The manufacture of silverware, the leading product, is under the control of the Oneida Community, a communistic society which has its headquarters in the city. In 1929 the manufactured output of Oneida amounted approximately to \$5,000,000; retail trade amounted to \$7,561,827. Oneida was settled by Sands Higinbotham in 1834, incorporated in 1848 and chartered as a city in 1901. The vicinity was once inhabited by the Oneida Indians and the site of their camping ground is the village of Oneida Castle nearby. Pop. 1920, 10,541; 1930, 10,558.

**ONEIDA COMMUNITY, THE**, an organization founded by John Humphrey Noyes at Oneida, N.Y., in Feb. 1848. It was of American origin, based on religious principles and lasted more than 30 years. There were about 300 members. Financial success was achieved mostly through industrial development.

Their distinctive institutions were directed toward the perfection of character, which was their primary aim. Improvement in individual character was aided

by mutual criticism. Abnegation of selfishness in the family led to complex marriage in place of monogamous marriage. Perfection of racial stock was attempted in their eugenic experiment, 1869-79. Marital relations were stringently regulated and the physiological method of male continence enabled them to control the birth rate. Selection of parents and careful rearing of children resulted in a progeny of which 82% survives after more than 50 years.

In deference to the increasing demand of public opinion, complex marriage was voluntarily abandoned in Aug., 1879, and monogamic marriage was reinstated. The reversion to monogamic marriage and other contributory causes led to reorganization into a joint-stock company. Equitable division of the stock was made among the members and Jan. 1, 1881, the present Oneida Community took over the business of the former society. H. H. N.

BIBLIOGRAPHY.—G. W. Noyes, *Religious Experience of John Humphrey Noyes*, 1923; W. A. Hinds, *American Communities*, 1908.

**ONEIDA LAKE**, a lake in central New York State, extending for 24 mi. in an east-west direction. The western extremity of the lake is approximately 12 mi. north of Syracuse. It has a maximum width of 6 mi.; its outlet, the Oneida River, drains into the Oswego River and thence into Lake Ontario. It forms part of the route of the Barge Canal which extends from Oswego on Lake Ontario to the Hudson River.

**O'NEILL, EUGENE GLADSTONE** (1888- ), American playwright, was born in New York City, Oct. 16, 1888, son of the romantic actor James O'Neill and of Ella Quinlan. The boy's early days, therefore, when he was not traveling with the Monte Cristo company, in which his father shone supremely for his picturesque melodramatic acting, were spent in boarding-houses, mostly under Catholic guidance. His education seems to have been desultory and varied. In 1902 he was in Stamford, Conn., at the Betts Academy, and in 1906 he spent a few months at Princeton. He was married in 1909, and shortly after began his wandering which took him as a gold prospector to Honduras. On his return to this country he fell into the most matter-of-fact occupation as assistant manager of the Viola Allan company, then touring in *The White Sister*. But by this time, his restless spirit took him to sea again aboard a Norwegian barque. Buenos Aires was the scene of his fragmentary efforts to earn a living. But O'Neill was drinking in the life about him, as in his reading he was feasting on Jack London and Kipling and saturating himself in the fiery doctrines of Nietzsche. In 1911 he was again in New York, pacing the waterfront of the city and in company with the same unusual crowds that attracted him in South America. Always the underdog drew from him quick sympathetic response.

Back in New London, Conn., Eugene became a "columist"; his creative urge took the form of poetry. In 1914 something happened to impel forward the

figure of O'Neill into the history of American drama. Clayton Hamilton, the critic, living the summer in New London, met him, talked with him and persuaded him to bring forth the crude drama scripts of several one-act plays he had written. Two things resulted therefrom. Hamilton persuaded James O'Neill, who did not seem to understand the restless spirit of his son, to finance a volume of these plays, called *Thirst*, 1914, now an enviable collector's item, and O'Neill packed his grip and went to Harvard to join George Pierce Baker's "Workshop 47." From 1915-16, Eugene was in New York, bosom friend of Radical and I.W.W. worker. Then his feet took him in the direction of Provincetown, Mass., where there was a band of far-seeing artists—presided over by George Cram Cook and Susan Glaspell. They produced O'Neill's first play to be done in public, *Bound East for Cardiff*, 1916. Faint murmurs of the existence of Eugene O'Neill began to reach the theatre world.

Broadway came to him in 1920, and there was a special performance of *Beyond the Horizon*, his first New York metropolitan appearance. Since then his influence has steadily grown. Some of his plays have been failures, some of them have not been understood, and always O'Neill has explained himself in the papers, a valuable autobiographical reflection of his influences, his sympathies, and his indifference to anything but the urge within him to do the thing he wants to do. If there is any one influence that has directed his genius, we must believe his statement that it is Strindberg. He has not yet overcome his resentment toward organized life, seared into his soul during his sea-faring days, and further embittered by his own dark experiences while living in New England. *Beyond the Horizon*, *Desire Under the Elms* 1924 and *Mourning Becomes Electra* 1931 are sharp shafts of personal hatred for the Puritan spirit. His dramas are distinctly commentary on his own state of mental unfolding.

Perhaps the nearest approach toward perfection of form is in *Mourning Becomes Electra* 1931, which, though it may be a New England rendering of Greek motives, is also an astute piece of melodramatic loyalty to the Monte Cristo days. Nevertheless, Eugene O'Neill—the Gladstone has now dropped from his name—always presents a technical challenge to the theater. His use of masks in *The Great God Brown* 1926 and his effective display of secondary dialogue in *Strange Interlude* 1928 place him far above any other American playwright in the creation of new methods for the revelation of the "new" psychology. He does not care whether or not his plays conform to either scientific truth or conventional ideas. He explains the conflicting racial interests and aims in *All God's Chillun Got Wings* 1924 and the unnatural murdering of a baby by its mother in *Desire Under the Elms* 1924 by saying, as Ibsen said himself, that his characters are particular cases. But in such folk drama as *The Emperor Jones* and in such diatribes against the social doctrines of his day as in

*The Hairy Ape* 1922, O'Neill excels both in the vividness of his outward picture and the intensity of his emotional feeling. When he touches history, as in *Marco Millions* 1928, he does so with the challenging force of Shaw re-writing history, though unfortunately, he has not Shaw's wit, nor Shaw's understanding of that other half of humanity, the white collar half.

The American drama was taken out of its parochial contentment by the appearance of Eugene O'Neill. He brought the attention of continental Europe to the fact that he was an American product. To-day the capitals of Europe know his name. He has won the Pulitzer prize three times.

In mood and philosophy, O'Neill's plays are not as unconventional as they appear; but the very energy of them has drawn down upon him from the various watch and ward societies the rigor of their unofficial hands. Each new play is a challenge and another evidence of his unique and so far undisputed place in the American theater and in the contemporary drama of the world.

M. J. M.

**BIBLIOGRAPHY.**—Barrett H. Clark, *Eugene O'Neill: the Man and his Plays*, 1929; Ralph Sanborn and Barrett H. Clark, *A Bibliography of the Works of Eugene O'Neill*, 1931; Montrose J. Moses, *The American Dramatist*, 1925; Barrett H. Clark, *An Hour of American Drama*, 1930, and Montrose J. Moses, *Dramas of Modernism and their Forerunners*, 1931.

**O'NEILL, JAMES** (1849-1920), American actor, father of **EUGENE O'NEILL**, playwright, was born at Kilkenny, Ireland, Nov. 15, 1849, and came to America at the age of five. His earliest success was as Bob Sackett in *Saratoga* and later he added his picturesque and vivid presence to *The Two Orphans*. He played Macbeth with **CHARLOTTE CUSHMAN**, and alternated leading Shakespearean rôles with **EDWIN BOOTH**. He played Christ in Morse's *Passion Play* and toured the country as Edmond Dantes in *Monte Cristo* for 16 years. Later he played D'Artagnan in *The Three Musketeers*. He died at New London, Conn., Aug. 10, 1920.

**ONEONTA**, a city in Otsego Co., southeastern New York, situated on the Susquehanna River, 61 mi. northeast of Binghamton. It is served by bus lines and two railroads. There are two airports. Oneonta has large railroad shops and textile and other factories. The value of the manufactured output, 1929, amounted to \$9,333,517. The retail business in 1929 amounted to \$10,947,949. The city lies in the foothills of the Catskill Mountains, at an altitude of 1,100 ft., surrounded by prosperous farming and dairying country. It is the seat of Hartwick College and a State Normal School. The city was founded as Milfordville in 1790, the name being changed in 1830. Oneonta was incorporated in 1848; granted a city charter in 1908. Gilbert Lake State Park is situated 12 mi. northwest. Pop. 1920, 11,582; 1930, 12,536.

**ONION** (*Allium Cepa*), a biennial plant of the lily family grown for its pungent, many layered bulb used since prehistoric times as a vegetable. The parent species, which grows wild in western Asia, has been greatly modified by long cultivation into numer-

ous varieties, such as the Spanish onion and the Bermuda onion among the solid bulb forms, the multiplier onion among those grown as a green vegetable or salad plant, and the top onion producing numerous bulbets used for propagation. The common field onion, one of the hardiest of root crop plants, is chiefly grown from seeds, the bulbs maturing at the end of the growing season. Spring onions for home use or for the early market are grown from specially propagated bulbs. Onion sets are ordinary onions, the growth of which has been arrested; when again planted they resume their growth. The onion is grown as a field or garden vegetable in every state, the total commercial crop exceeding in value that of all other minor vegetables except tomatoes, lettuce and cabbage; Texas, California and New York usually lead in production. X.

The production in the United States is as follows:

#### ONION PRODUCTION, U.S.

4-Year Average, 1927-30

Division	Acreage	Production (1,000 Bu.)	% of Tot. Prod.
UNITED STATES .....	81,848	23,961	100.0
LEADING STATES:			
Texas .....	17,723	3,625	15.1
California .....	9,735	2,958	12.3
New York .....	7,568	2,864	12.0
Indiana .....	8,533	2,677	11.2
Ohio .....	7,053	1,814	7.6
Colorado .....	5,165	1,731	7.2

**Cultivation.** Onions are hardy and do well on most garden soils, yet commercial crops are grown on light, friable, well drained soil rich in humus and plant food and as free as possible from weeds. Reclaimed swamps are especially favorable. On such lands they usually form a rotation with lettuce, celery and carrots. In the "new onion culture" seed is sown in hotbeds in late winter and the seedlings transplanted about three inches asunder in rows 12 or 15 inches apart. The labor of transplanting is scarcely more than that of thinning the excess plants grown from seed sown directly in the open ground. Clean cultivation is essential, especially while the plants are small. When the tops die the ripe bulbs are pulled, dried, cleaned and stored or marketed. M. G. K.

**ONONDAGA**, a North American Indian tribe, an important member of the Iroquois Confederacy. They dwelt formerly on the mountain, lake and creek of the same name in Onondaga Co., N.Y., as well as in the district northward to Lake Ontario and southward to the Susquehanna River. Their present reservation is near Syracuse, N.Y., where farming and dairying are carried on, and the tribal unity is maintained, though with some dissension between a so-called pagan and a Christian group. One group of the Onondaga lives on Grand River Reservation in Canada.

**ONONTIOGO**, a group of North American Indians known as French, Montreal or Quebec Indians, who were conquered by the Iroquois and in 1670 lived with the Seneca, Huron and Neutrals.



**ONTARIO**, formerly called Upper Canada and Canada West, a province of Canada, having as boundaries Hudson Bay on the north, Quebec on the east, Manitoba on the west and the Great Lakes on the south. For geographical purposes Ontario is usually divided into two sections: Southern Ontario, or Old Ontario, a farming and industrial region with an area of about 77,000 sq. mi., situated along the St. Lawrence valley and in the vicinity of lakes Erie and Ontario; and Northern Ontario, or New Ontario, having an area of about 330,000 sq. mi., comprising the whole northern section of the province and crossed by the Laurentian plateau.

**Area and Population.** The area of the province is 407,262 sq. mi. Its greatest extent from north to south is 1,050 mi., between 57° and 42° N. lat., and from east to west nearly 1,000 mi. Measured by the Canadian Pacific Railway from east to northwest is 1,285 mi. Of the total area of the province, water forms about 10% (41,382 sq. mi.). Pop., 1901, 2,182,947; in 1911, 2,527,292; in 1921, 2,933,662; and in 1931, 3,431,683. Most of the inhabitants are Canadian born, the descendants of English, Irish and Scottish immigrants. French-speaking inhabitants are found in that portion of the province bordering on the St. Lawrence, and in the newer sections of the north. There are about 25,000 Indians, living mainly on reservations.

The chief cities and towns are **TORONTO**, the capital and largest city; Ottawa, the seat of the Dominion government; Hamilton, London, Kingston, Brantford, Peterborough, Fort William, Port Arthur, Sault Ste. Marie and Windsor.

**Natural Features.** The province is well provided with lakes, numerous lakelets, rivers and streams. Running from east to west through the northern portion is the region of pre-Cambrian rocks, valleys, lakelets and peaty swamps which form the divide or watershed for the drainage. On the south side is the basin of the St. Lawrence, with its tributary, the Ottawa. On the north side is the basin of the rivers flowing into James and Hudson bays. The triangular peninsula of Southern Ontario is in that part of the St. Lawrence basin south of Lake Nipissing. This area is undulating in surface and generally of clay loam or sandy loam, retentive in soil, good in drainage, plentiful in spring water, and, being adjacent to the Great Lakes, abundant in rain. The soil is capable of yielding a diversity of products: pasture grasses for livestock, cereals, vegetables, apples, peaches and grapes. What is known as the great clay belt of Northern Ontario is a large area in the basin of the rivers flowing north of the pre-Cambrian plateau. It is adapted for the production of cereals, grasses and vegetables, for dairying and the raising of livestock.

Besides lakes Superior, Huron, Erie and Ontario, which partly belong to the United States, the province has other large lakes, such as Simcoe, Nipissing, and Nipigon. The St. Lawrence, Ottawa, Niagara and Albany are boundary rivers.

**Climate.** There are great variations of climate.

Southern Ontario has no great extremes of heat and cold, for the Great Lakes make the climate milder than many regions in a lower latitude. There is heavy snowfall farther north, between Georgian Bay and Ottawa. The winters of the clay belt towards Hudson Bay are cold, but milder than the districts around the north of Lake Superior where the winters are long and cold, sometimes with temperatures as low as -50° F. Annual rainfall is between 30 and 40 in.

**Agriculture.** Ontario is essentially an agricultural country, as the soil, for the most part, is of excellent quality. Field crops, dairying and mixed farming are the main activities. Oats, barley, corn and wheat are cultivated. The value of the butter and other milk products has reached an annual value of \$85,000,000, about half the total amount in the Dominion. The livestock industry is important, the province claiming a lead over the other Canadian provinces in the number of milch cows, sheep and swine. The soil and climate of the southern border counties appear favorable to the production of tobacco; after years of experimentation it is now grown extensively in over 33,000 acres near Lake Erie in Essex and Kent counties. Flax is grown in the southwestern peninsula, the north shore district of Lake Ontario and the St. Lawrence valley; both fiber and fiber-seed for sowing purposes are produced, the fiber for the manufacture of linen and most of the seed for export to Ireland. Large

**PRINCIPAL FIELD CROPS, ONTARIO**  
1930 and Five-Year Average 1925-1929

<i>Crop</i>	<i>Area</i>	<i>Yield Per Acre</i>	<i>Total Yield</i>	<i>Total Value</i>
	acres	bu.	bu.	\$
Wheat ..... 1930	776,000	26.1	20,226,000	14,563,000
Av. .... 1925-29	851,129	25.6	21,772,060	26,910,340
Oats ..... 1930	2,469,000	39.5	97,482,000	29,245,000
Av. .... 1925-29	2,670,746	36.2	96,567,500	51,013,020
Barley ..... 1930	610,000	34.3	20,911,000	8,155,000
Av. .... 1925-29	527,555	32.1	16,915,660	12,389,540
Rye ..... 1930	53,000	17.7	937,000	515,000
Av. .... 1925-29	75,132	17.5	1,315,720	1,194,220
Peas ..... 1930	80,000	19.8	1,581,000	1,976,000
Av. .... 1925-29	105,274	18.3	1,930,460	2,882,680
Beans ..... 1930	68,000	13.3	905,000	1,901,000
Av. .... 1925-29	54,928	17.1	936,860	2,625,120
Buckwheat ..... 1930	275,000	20.6	5,676,000	3,406,000
Av. .... 1925-29	261,529	21.2	5,540,220	4,405,480
Mixed grains ..... 1930	958,000	39.2	37,512,000	15,005,000
Av. .... 1925-29	810,105	37.6	30,467,620	20,729,580
Corn ..... 1930	130,000	39.6	5,149,000	4,377,000
Av. .... 1925-29	143,982	40.7	5,864,060	5,595,140
Potatoes ..... 1930	159,000	cwt.	cwt.	
Av. .... 1925-29	161,361	69.0	10,965,000	8,772,000
Turnips ..... 1930	105,000	60.7	9,796,580	14,713,780
Av. .... 1925-29	106,928	172.6	18,125,000	7,250,000
		192.3	20,564,200	8,318,480
		tons	tons	
Hay and clover 1930	3,329,000	1.58	5,263,000	53,946,000
Av. .... 1925-29	3,442,258	1.63	5,595,040	64,261,280
Alfalfa ..... 1930	642,000	2.20	1,410,000	16,568,000
Av. .... 1925-29	706,925	2.39	1,687,900	20,710,560
Fodder corn ..... 1930	312,000	8.39	2,619,000	11,786,000
Av. .... 1925-29	330,948	8.77	2,901,840	12,132,420
Sugar beets ..... 1930	38,000	8.90	340,000	2,380,000
Av. .... 1925-29	39,994	9.54	381,640	2,598,980



linseed oil and oil cake mills have been established in western Ontario in connection with flax production. The honey of the province gained a reputation throughout and outside the province sufficient to make bee-keeping a successful industry. In the Niagara peninsula and along the shores of lakes Erie and Ontario fruit-growing is extensive; apples, peaches, grapes, pears, plums and cherries are the principal fruits grown, and canning is an industry of local importance.

**Water Power.** The Ontario Hydroelectric Power Commission which was appointed in 1906 by the provincial legislature to undertake the development, generation, transmission and distribution of electrical energy, is supplying light and power from the Niagara River and other falls at almost cost price to over 200 towns extending from Toronto to Windsor, and is operating transmission station systems which give power to several industrial centers. An international treaty restricts Canada to a total diversion of 36,000 and the United States to 20,000 cu. ft. of water per second on the Niagara. Each can draw an additional 10,000 cu. ft. per second in winter. The development of Niagara power has made a great contribution towards the industrial progress of the province, long retarded by the necessity of importing coal.

**Mining.** Ontario has an abundance of practically all the economic minerals with the exception of coal and tin. The development of the mining industry on a great scale followed the construction of the Canadian Pacific Railway in 1883, when the rich nickel-copper ores of the Sudbury district were found. Ontario now produces more than three-fourths of the world's output of nickel. The production from the Sudbury camp has been a considerable factor in the development of the province. From 1889, when nickel was first produced from this area, to the end of 1925, the total production was worth \$275,627,949. Copper, lead and zinc ores are also mined in the Sudbury region.

Canada stands third among the platinum producers of the world, although the supply is greatly exceeded by Russia and Colombia, South America. The Sudbury district produces about one-fourteenth of the world's annual production of platinum. The cobalt area has been one of the richest mining camps for its size ever discovered. By the end of 1925 it had produced 340,258,799 ounces of silver valued at over \$325,000,000 and had paid dividends of about \$90,000,000. Prior to the discovering of gold at Porcupine in 1909 the mining of this metal was carried on with indifferent success, but since 1910, when the Porcupine camp arrived at the producing stage, Ontario has had a considerable output, and the Porcupine as well as the Kirkland Lake group have attained world-wide fame. A branch line has been made from Chelmsford to the copper, silver and nickel mine at Errington and development work commenced in 1929 over three miles of territory. Natural gas is found along the north and east shores of Lake Erie, and petroleum is produced in Lambton and Middlesex counties.

MINERAL PRODUCTION, ONTARIO, 1929

Item	Production	Value \$	Rank Among Provinces
Cobalt ..... lb.	929,415	1,801,915	1
Copper ..... "	88,879,853	14,622,572	2
Gold ..... oz.	1,622,267	33,535,234	1
Nickel ..... lb.	110,275,912	27,115,461	1
Palladium, rhodium, etc. ... oz.	17,141	802,453	1
Platinum ..... "	12,474	843,928	1
Silver ..... "	8,890,726	4,711,462	2
Natural gas ... M cu. ft.	8,586,475	4,959,695	1
Gypsum ..... tons	100,347	832,689	2
Salt ..... "	302,445	1,420,424	1
Clay products ..... "	..	6,830,162	1
Cement ..... bbl.	4,624,712	6,608,246	2
Lime ..... tons	370,158	3,364,411	1
Sand and gravel ..	11,358,568	3,462,379	1
Stone ..... "	5,239,672	4,736,263	2
Other products ..... "	..	2,015,211	—
Total all products ..	..	117,662,505	1

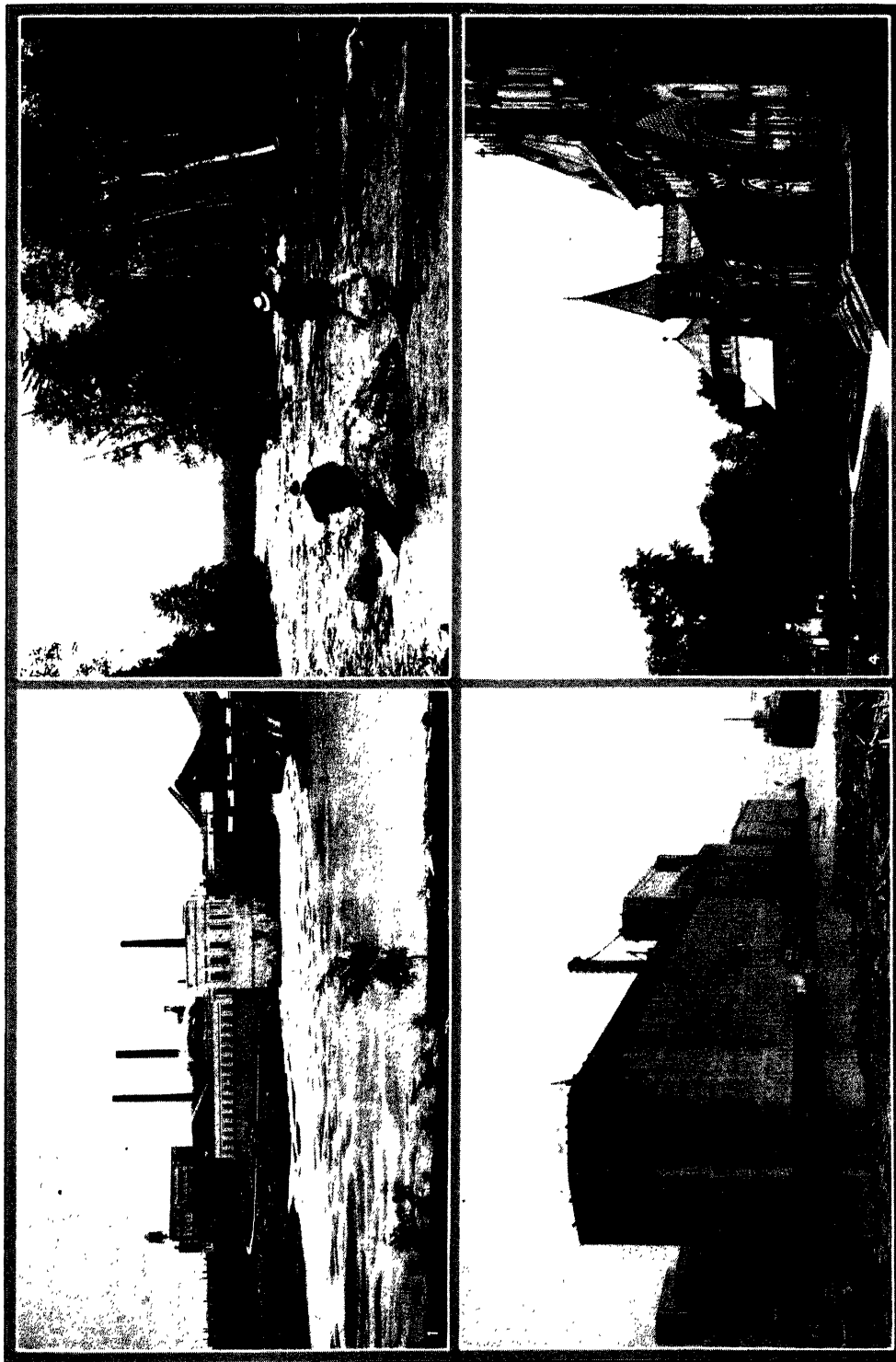
**Forestry.** Timber resources of the province are among the best in the Dominion. In the northern districts great forests of white pine, spruce and poplar occur. In the central districts are found maple, beech, yellow birch, basswood, elm and black ash; almost all the pine has been cut from this region. There is a large supply of pulpwood in the southern part of the forest regions. It is estimated that the forest lands of the province cover an area of 146,000 sq. mi. The principal lumber districts are situated on the Upper Ottawa, north of Georgian Bay and west of Lake Superior. There are many pulp and paper mills in operation. For the permanent conservation of the forests five areas with a total of 17,860 sq. mi. were set aside as reserves by the provincial government, and lands which have been cleared and found unsuitable for agriculture are gradually being restored by reforestation, the government distributing at least 7,000,000 trees annually from its nurseries.

**National Parks.** The ancient forest and its life are preserved in the Dominion parks. The Algonquin National Park is about 2,000 sq. mi. in area, with numerous lakes and streams supplied with trout and bass. The Timigami National Park, about 300 mi. north of Toronto, is a virgin territory of nearly 4,000,000 acres, containing moose, some red deer, grouse, partridge, and wild duck, which are protected by stringent laws. In Lake Timigami there are 1,589 islands, surveyed and numbered.

**Manufactures.** In gross value of manufactured products Ontario leads the other provinces. Some of the chief industrial products and manufacturing industries are automobiles, iron and steel goods, machinery, foodstuffs, footwear, clothing, agricultural instruments, pulp and paper, butter and cheese, furniture, paints, sawmills, electric light and power.

**Transportation.** The Great Lakes, the St. Lawrence and other rivers and the canal systems provide excellent facilities for ship traffic. The populated areas are well supplied with railroads. The bridges and tunnel between the United States and Ontario add

## ONTARIO

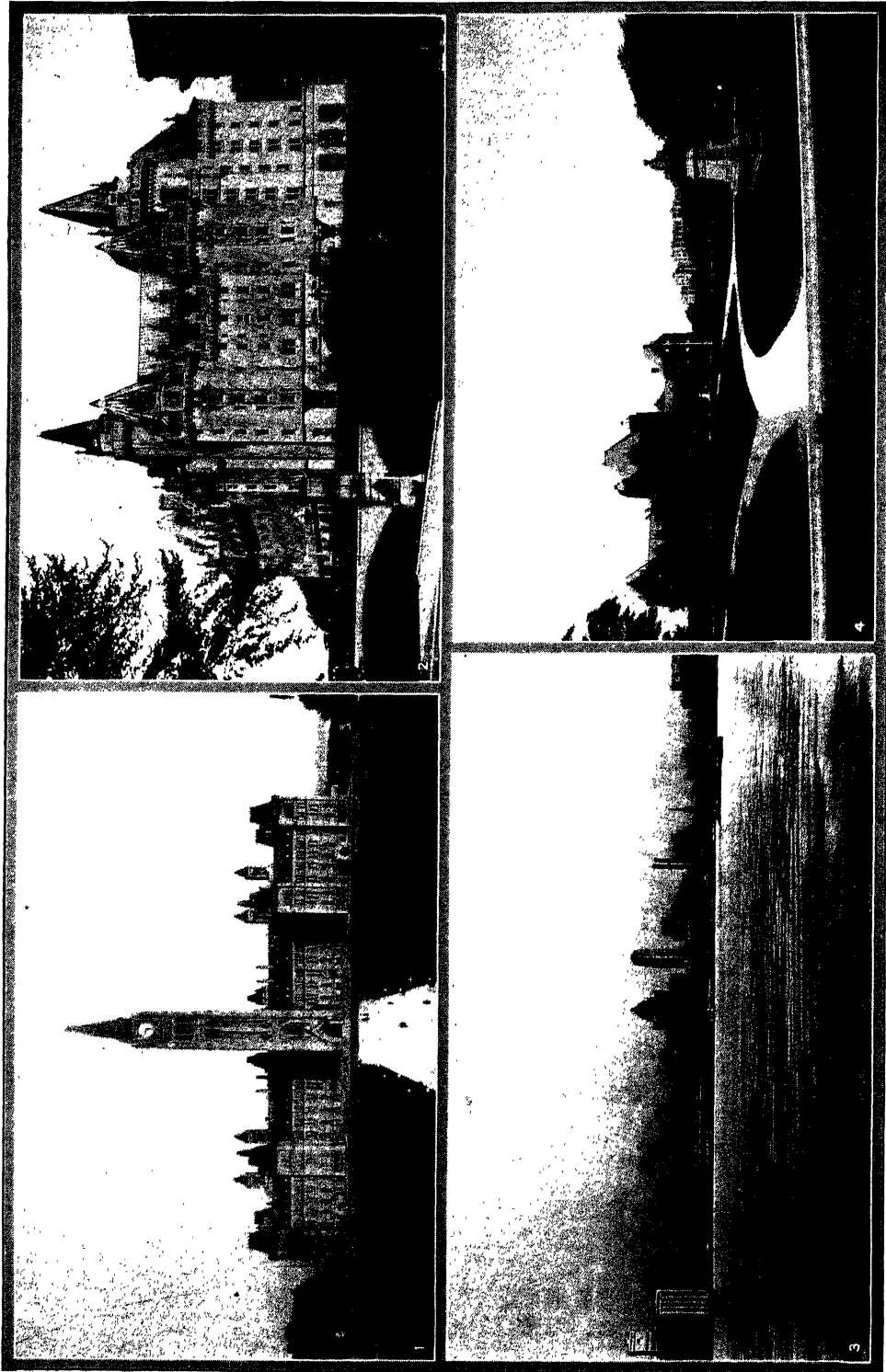


COURTESY CANADIAN NATIONAL RAILWAYS

### INDUSTRIAL, EDUCATIONAL AND SPORTING SCENES IN ONTARIO

1. Spruce Falls Pulp and Paper Company, Kapuskasing.
2. Snowshoe Rapids on the Petawawa River, Algonquin Park.
3. One of the world's largest elevators (capacity 6,900,000 bushels), Port Arthur.
4. University of Toronto, Toronto.

# ONTARIO



1. 2. 4. COURTESY CANADIAN NATIONAL RAILWAYS. 3. CANADIAN PACIFIC RAILWAYS

## TORONTO AND OTTAWA, LEADING CITIES OF ONTARIO

1. Dominion Parliament Building, Ottawa.
2. Chateau Laurier Hotel, Ottawa.
3. Skyline of Toronto, from Lake Ontario.
4. Provincial Parliament Buildings, Toronto.



# ONTARIO

Area 407,262 sq. m.  
Pop. .... 8,431,683

## PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands

3 Amherstburg R 1  
4 Arnprior . . . D 20  
4 Aurora . . . J 12  
8 Barrie . . . I 11  
14 Belleville . . I 17  
3 Blind River A 2  
4 Bowmanville . . K 14

6 Brampton . . . K 11  
32 Brantford . . . N 9  
10 Brockville . . H 22  
3 Burlington M 10  
3 Campbellford . . I 16

4 Carleton Place . . P 21  
15 Chatham . . . P 8  
4 Cobalt . . . Q 25  
6 Cobourg . . . J 15  
4 Cochrane . . . O 24  
6 Collingwood . . H 9

11 Cornwall . . . F 25  
3 Dunnville . . O 11  
3 Eastview . . D 22  
3 Fergus . . . K 9  
5 Ft. Frances . . P 15  
26 Ft. William . . P 18  
14 Galt . . . M 9

4 Gananoque . . I 21  
4 Goderich . . . K 5  
21 Guelph . . . L 9  
3 Halleybury . . Q 24  
156 Hamilton . . M 10  
3 Hanover . . . J 7  
5 Hawkesbury . . C 25

3 Hespeler . . . L 9  
8 Huntsville . . E 12  
5 Ingersoll . . . N 7  
7 Kenora . . . Q 15  
23 Kingston . . . I 30  
31 Kitchener . . . L 8

5 Leamington . . R 2  
8 Lindsay . . . I 14  
3 Listowel . . . K 7  
71 London . . . N 6  
3 Meaford . . . H 8  
3 Merriton . . . N 12  
7 Midland . . . G 10  
7 Mimico . . . L 11

3 Nanawake . . I 19  
4 Newmarket . . J 12  
19 Niagara Falls . . N 13  
16 North Bay . . A 12  
4 Oakville . . . M 11  
3 Orangeville . . J 10

8 Orillia . . . H 12  
23 Oshawa . . . J 13  
127 Ottawa . . . D 22  
13 Owen Sound . . H 7  
4 Paris . . . M 9  
4 Parry Sound . . E 10

9 Pembroke . . C 18  
4 Penetanguishene . . G 10  
4 Perth . . . F 21  
22 Peterboro . . I 15  
3 Petrolia . . . N 4  
4 Picton . . . J 18

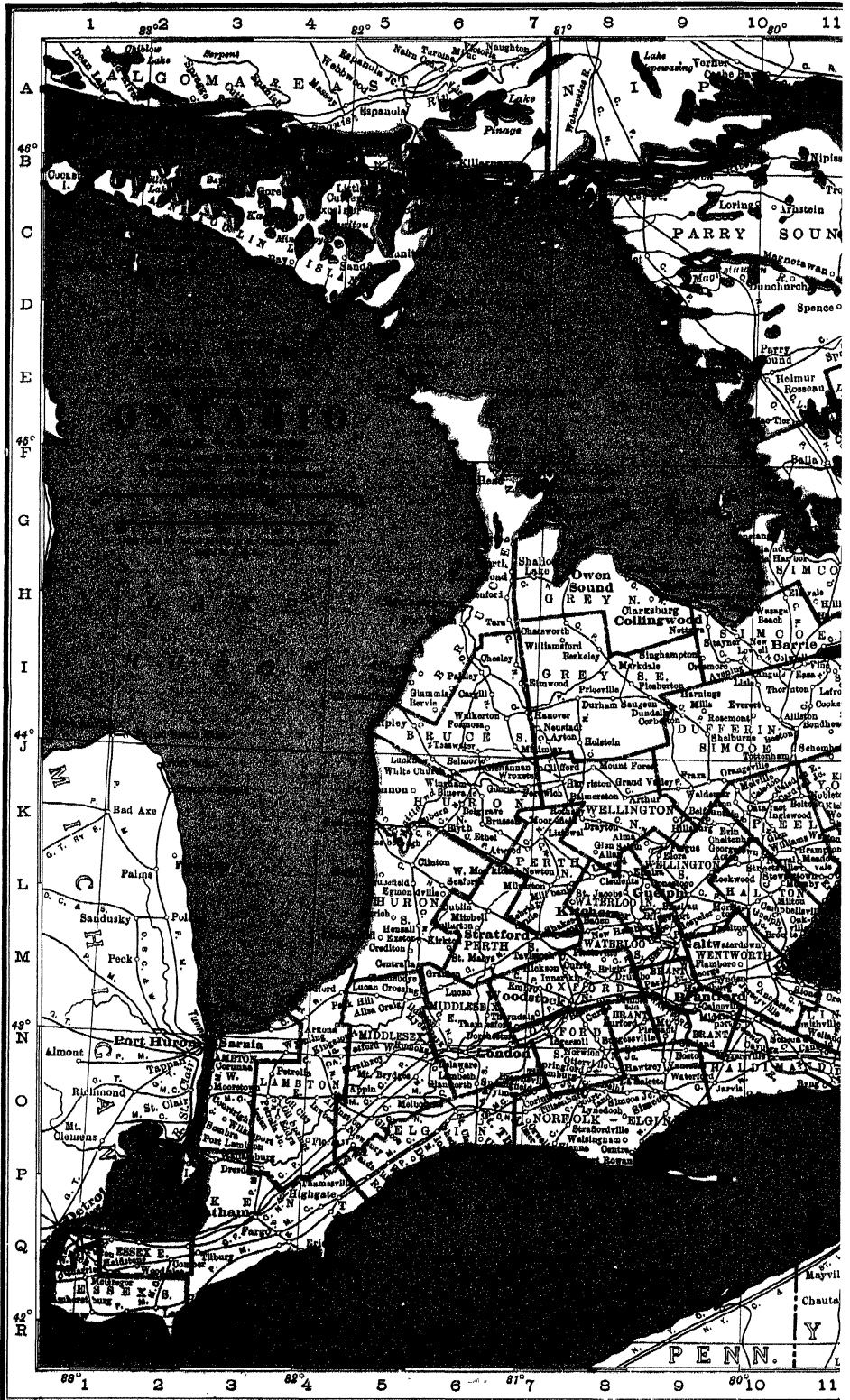
20 Port Arthur . . P 18  
7 Port Colborne . . Q 12  
5 Port Hope . . I 15  
3 Portsmouth . . I 20  
3 Prescott . . . G 23  
6 Preston . . . M 9

5 Renfrew . . . D 19  
25 St. Catharines . . R 21  
4 St. Marys . . . M 6  
15 St. Thomas . . O 6  
11 Sandwich . . . Q 1  
18 Sarnia . . . N 3  
23 Sault Ste. Marie . . R 21

5 Simcoe . . . O 9  
7 Smiths Fts . . G 21  
18 Stratford . . . M 7  
3 Strathroy . . . N 5  
4 Surgeon Falls . . R 24

19 Sudbury . . . R 23  
5 Thorold . . . N 12  
3 Tilsonburg . . O 8  
14 Timmins . . . P 23  
631 Toronto . . . L 12  
6 Trenton . . . J 17

10 Walkerville . . Q 1  
4 Wallaceburg . . P 8  
11 Welland . . . N 12  
5 Weston . . . K 11  
5 Whitby . . . R 18  
63 Windsor . . . Q 1  
11 Woodstock . . N 7







greatly to the facilities for tourist traffic. The International Peace Bridge across the Niagara River near Buffalo, N.Y., and Fort Erie, Ont., was opened in 1927; the Ambassador Bridge between Detroit, Mich., and Sandwich, Ont., in 1929; and the International Tunnel, Detroit to Windsor, Ont., in 1930. Since 1854, when by treaty the United States conceded the privilege of free navigation on Lake Michigan to Canada, and Britain conceded to the United States the navigation of the St. Lawrence, both countries have had joint use of the series of Canadian and American canals that make navigation possible west from Lake Superior. The airplane has been used in prospecting for minerals. Huge craft, capable of transporting men and supplies, are made use of in reaching distant fields.

**Education.** The work of elementary and secondary education is under the supervision of a provincial department in charge of a cabinet minister. The elementary schools are free, and attendance is compulsory for children between the ages of 6 and 16. The schools are non-sectarian, but the Roman Catholics have a constitutional right to have schools of their own, where religion is taught, but where the secular subjects are regulated by the same provisions as govern the State schools. The agricultural college at Guelph is well known for the excellence of its teaching facilities. The principal universities are the University of Toronto at Toronto, Western University at London, Queen's University at Kingston, and University of Ottawa at Ottawa.

**History.** Ontario was first colonized in 1783 by Loyalists who came from the United States after the War of Independence. A number of officers who accompanied them were given appointments as magistrates with special powers over the Loyalists who numbered about 10,000. They were of various origins, Highland Scottish, Irish, German, Dutch, French and English. The province was named Upper Canada in 1791, when Quebec was divided by the Constitution Act (*see CANADA*). The British North American Act of 1867 created the province of Ontario and the first legislative assembly met at Toronto on Dec. 27 of that year.

**ONTARIO**, a city in San Bernardino Co., southern California, situated 38 mi. east of Los Angeles, served by three railroads, the Pacific Electric Railway and by buses. There is a municipal airport. The region is noted for its nuts and for citrus and deciduous fruits. Rabbit-raising is a specialty. The chief industries of Ontario are fruit canning and packing and the manufacture of electrical appliances. The retail trade in 1929 amounted to \$8,698,372. It is the seat of Chaffey Junior College of Agriculture. The city is beautifully laid out on a sloping plateau at the base of Mt. San Antonio, or Old Baldy. Founded in 1882, Ontario was incorporated in 1891. Pop. 1920, 7,280; 1930, 13,583.

**ONTARIO, LAKE**, the easternmost of the five Great Lakes in east central North America. It lies across the boundary separating New York State from

the province of Ontario, between 43° 10' and 44° 10' N. lat. and 76° 10' and 79° 53' W. long. This is the smallest of the lakes and marks the end of the chain. It receives the surplus waters of Lake Erie through the Niagara River and discharges by way of the St. Lawrence River into the Atlantic Ocean. Its greatest length is 193 mi., breadth 53 mi., and surface area 7,540 sq. mi., 3,560 of which lies within the United States. Its mean depth of 300 ft. and maximum depth of 738 ft. are below sea level, since its mean elevation is 246.11 ft. This is 326.32 ft. below Lake Erie, due to the descent of the Niagara River, which is interrupted by the famous Niagara Falls 167 ft. high. The Welland Canal with eight locks runs parallel to the river and provides a navigable ship channel between Erie and Ontario. The coast line of the latter body, measuring 540 mi., is regular except near the beginning of the St. Lawrence channel where Sacketts Harbor indents the New York shore and numerous small bays cut into the Ontario coast. Prince Edward Island and the Thousand Islands are situated in this part of the lake.

Its drainage basin comprising 34,630 sq. mi. includes 18,710 sq. mi. of United States territory. The Genesee River drains into Ontario from the south at Charlotte, the harbor for Rochester, N.Y., which is the largest United States city on its shores. Toronto is situated on the Ontario side. In 1929 the Rochester harbor handled shipments aggregating 1,637,677 tons, the bulk of it coal. Large Canadian cargoes, including the surplus wheat from the prairie provinces, are carried across Ontario and down the St. Lawrence on their way to foreign ports. The season of navigation on the lake extends generally from the middle of April to the middle of December.

Lake Ontario was first seen by white men in 1615 when the French explorer, CHAMPLAIN, was led to it by Huron Indians during a campaign against the Iroquois. The first lake steamer named *Ontario* was launched on its waters at Sacketts Harbor in 1817 and shortly thereafter, in 1829, the Welland Canal was opened, connecting Ontario with the upper lakes.

**ONTOGENY**, a term introduced by Haeckel for the developmental history (ontogenesis) of the individual in contrast and comparison with Phylogeny (phylogenesis), the development of the race. Ontogeny is interpreted as a summing up of the racial history (biogenetic law or recapitulation).

**ONTOLOGY**, a branch of metaphysics. It attempts to discover the most general forms of being. This is the sense in which Wolff used the word, and that which is generally recognized. In metaphysics the distinction is made between being in its most general forms and the concepts of self, God and world, ontology being confined to the former sphere of interest.

**ONYX**, properly applied to a banded form of QUARTZ which, like AGATE, consists of different layers, white and black, white and red, or other colors. Onyx, however, has the layers in even planes with straight banding, a fact responsible for its use in



cameo-making. This form of quartz belongs to the chalcedonic, or cryptocrystalline, varieties of that mineral.

Mexican onyx or marble onyx refers to a form of CALCITE deposited in flat bands of variegated color,



FROM KRAUS AND HOLDEN, GEMS AND  
GEM MATERIALS. MCGRAW-HILL  
ONYX FROM BRAZIL

or in wavy parallel bands. Such deposits are usually formed in streams, calcareous springs, or in caverns. In the latter case it is stalagmitic. A white variety was used by the ancients for making alabasters, and was sometimes called ALABASTER and onychites. It is now known as Oriental

or Egyptian alabaster. MARBLE onyx is found in Mexico and in Missouri, Arizona and California. Chalcedonic onyx is found in Mexico and New Mexico. See also CHALCEDONY; TUFA; TRAVERTINE; STALACTITE; STALAGMITE.

**OÖLITE**, a form of LIMESTONE composed largely of grains of CALCITE, of concentric structure and spherical in shape. The name is derived from the Greek for egg, referring to the fact that such limestone frequently resembles fish roe. When the grains approach the size of a pea, the name pisolite is applied. Other minerals, such as quartz, hematite and glauconite occurring in this form are said to have an oölitic structure. Usually a bit of shell, or grain of sand, forms the nucleus about which the concentric shells are deposited. Oölitic sands may be seen forming on the shores of the Great Salt Lake. At Carlsbad, Bohemia, oörites constitute important beds of limestone. Oölitic iron ores are mined in southeastern United States and in France.

**OOZE**, the name given to the deposits covering the ocean floor, otherwise called marine sediments. Near the coasts and in moderate depths these are made up largely or partly from the remains of land animals and pulverized rocks, and are called liottoral and terrigenous deposits. The former are found only in the immediate environment of the coast-line. The latter descend to greater depths and consist largely of blue mud, which is typical of the Atlantic, while the less abundant green mud, volcanic and coral mud and sands cover only a few million square miles each.

At greater depths, generally beyond 2,000 feet or more, these terrigenous deposits are replaced by the pelagic deposits, or more typical oozes, among which five varieties are distinguished. The globigerina ooze, containing largely the calcareous remains of planktonic Foraminifera, covers nearly 50 million square miles, and is typical of the Atlantic. The pteropods are comparatively scarce, while the silicious radiolaria occur chiefly in the Pacific, and the diatoms, about 11 million square miles, are found in the southern and antarctic waters. Deepest of all lies the red clay, more than 50 million square miles in extent and mostly in the Pacific. It contains very little calcium, much iron and manganese and sometimes traces of

fish bones, though usually it is entirely inorganic in nature. Part of the iron is ascribed to meteoric dust, formed by burning meteors in the atmosphere, which falls into the sea and ultimately makes its way to the bottom.

**OPAL**, an amorphous or non-crystalline form of silica containing from 1 to 20% water. It is known principally for its use as a GEM STONE, but the common, non-precious variety is of widespread occurrence. Opal forms from the decomposition and solution of silicate minerals and the subsequent redeposition of the dissolved silica in cracks and cavities in the rocks as a slowly drying gelatinous mass. This goes on especially in recently erupted LAVAS. Buried woody material is often replaced with this amorphous silica, producing opalized wood.

Common opal is translucent to opaque and of dull coloring. It occurs as concretions in limestone and shale and with CHALCEDONY and FLINT. Geyserite and siliceous sinter are forms deposited around hot-springs, as in Yellowstone Park. Diatomite, tripolite and infusorial earth are opaline silica.

Precious opals show a scintillating play of colors. This results from breaking up white light into its component colors within the mineral, caused by minute cracks, or by patches of differing water content and therefore of different refractivity. It has no relation to the "fire" caused by dispersion in other gem stones. The same phenomenon may be seen in oil films on water, and in minute cracks in ice. White opals are those of a light color; black opals are dark gray, blue or black, and are highly valued. Fire opals are semitransparent, showing a play of red or yellow.

The early source of opals was Hungary. Fine examples are also found to-day in Australia, Honduras, Mexico, and in Nevada and Idaho. See also DIATOMACEOUS EARTH; PRECIOUS STONES. S. F. K.

**OPAVA** (*Troppau*), a Czechoslovak city, the former capital of Austrian Silesia, near the Prussian frontier. Opava has four suburbs and several handsome squares. There are six churches, among them the chief parish church, the Jesuit church, a Protestant church and a synagogue; also a government house, city hall and theater. Fine promenades replace the earlier fortifications. The chief products are sugar, textiles, hats, machines and other diversified commodities. Opava dates back to the 12th century and was the seat of several rulers of the district. In 1820 the emperors of Austria and Russia and the king of Prussia met there and agreed to maintain the status quo of 1815. Most of the inhabitants are Germans. Pop. 1930, 36,083.

**OPELIKA**, a city in eastern Alabama, county seat of Lee Co., situated 30 mi. northwest of Columbus, Ga., served by bus lines and two railroads. It is a market and shipping center for an agricultural district, the chief crops of which are cotton and corn. The principal industry is cotton textile manufacture. Opelika was founded in 1837; incorporated in 1858. Nearby, at Auburn, is Alabama Polytechnic Institute. Pop. 1920, 4,960; 1930, 6,156.

**OPELOUSAS**, a city in southern Louisiana, the parish seat of St. Landry parish, situated 22 mi. north of Lafayette. It is a transportation center served by three railroads, and ships rice, livestock, corn and cotton, as well as lumber and other products locally manufactured. Pop. 1920, 4,437; 1930, 6,299.

**OPEN DOOR**, a distinctive foreign policy of the United States, and generally associated with JOHN HAY and his celebrated circular addressed to the powers on Sept. 6, 1899. Neither the term nor the rule which it denotes began with the circular. The Open Door in general means equality of opportunity and, as applied to the Far East, means commercial equality. The principle was applied in all of the early treaties with the East to which the United States was a party, and was used by the American peace commissioners in 1898 when they demanded the Philippines from Spain, in order that the United States might there maintain "an open door to the world's commerce." It was applied to the special situation of China, and meant that powers enjoying certain spheres of influence could not claim preferential rights in trade and commerce.

C. E. MA.

**OPEN FIELD SYSTEM**, the usual method of cultivating land in medieval Europe. The manor and its attached village were surrounded by two, or more commonly three, large arable fields. These fields were divided into strips of land which were the holdings of the lord and his dependents. Individual holdings were scattered among the fields and each individual cultivated his own strips of land and also those belonging to his lord. Each person also had certain rights upon the common waste. The fields were cultivated in rotation, one of them lying fallow each year. The usual rotation was winter wheat or rye; spring corn, peas or beans; and fallow. Little was known about the properties of the soil and allowing one of the fields to lie fallow was the only means of regeneration. As soon as more became known about the science of agriculture, the scattered holdings were enclosed and crops were grown in scientific rotation.

E. W. G.

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**OPEN-HEARTH PROCESS**, a method of making steel from steel scrap and pig iron. The process is carried out in a regenerative REVERBERATORY FURNACE. It is necessary to recover heat from the waste gases and to preheat the air for combustion in order to reach the high temperatures necessary in steel making. Producer gas, coke-oven gas, natural gas, tar, oil, blast-furnace gas, and combinations of these are used as fuels. About 5,000,000 B.t.u. are required per ton of steel made.

There are two types of open-hearth furnaces—acid and basic, the latter producing by far the largest tonnage. In the acid process the furnace hearth is lined with silica sand and in the basic process the hearth is lined with a basic material such as burned magnesite or burned dolomite. A 100-ton open-hearth furnace will produce steel at the rate of about 10 tons per

hour. The hearth of such a furnace is about 40 ft. long by 16 ft. wide and the bath of metal is 24 to 30 in. in depth. Open-hearth furnaces vary from 30 to 400 tons in capacity. Some furnaces are made with a tilting arrangement so that part or all of the steel may be withdrawn.

To produce steel from pig iron, it is necessary to remove carbon, manganese, phosphorus, sulphur, and silicon from the iron. These impurities are oxidized out of the pig iron by additions of iron ore and by oxidation of the liquid bath by the furnace gases. Carbon is oxidized to form carbon monoxide which is eliminated as gas. Manganese, phosphorus and silicon upon oxidation form oxides which being lighter than steel, rise to the surface of the metal and form a slag. In the basic open-hearth process about 10% of the total charge consists of limestone which fluxes the above-mentioned oxides and prevents their re-entry into the metal. In addition, the lime combines with some of the sulphur in the metal, forming stable sulphides and sulphates, and a portion of the sulphur in the charge is thus eliminated. In the acid open-hearth the acid constituent silica predominates in the slag and it is impossible to remove phosphorus and sulphur by this process. After the metal has been properly refined, the steel is tapped into a large ladle which is carried to a platform where ingots are poured. The pouring is done through a hole in the bottom of the ladle which is suitably stoppered.

C. H. H.

**OPENING**, in textile manufacturing, a process by which matted fiber is made fluffy and open. A certain amount of cleaning and mixing is accomplished in some of the opening operations. Opening is of particular importance in cotton manufacturing (*see* COTTON MANUFACTURE) because of the compressed form in which the fiber in the bales is received by the mill. A number of machines are required for this work, including a bale breaker which has moving, endless, spiked aprons to tear masses of fiber apart. A vertical opening machine or "opener" consists of a revolving vertical shaft with arms extending horizontally, which are short at the bottom and gradually lengthen toward the top, the whole inclosed in a cleaning grid shaped like an inverted cone; the cotton enters at the bottom of the cone and, as it becomes more open and hence lighter, rises to the top (assisted by a current of air) and passes out of the machine. The cylindrically shaped Buckley type of opener employs a horizontal revolving shaft equipped with radial arms of equal length; the cotton enters near one end of the cylinder, is carried spirally around against a cleaning grid, and leaves near the opposite end.

E. D. F.

**OPEN PIT**, in mining, a method of working MINERAL DEPOSITS which occur near the surface and so make it more economical to remove the OVERBURDEN and extract the valuable minerals from the surface, instead of going to the expense of sinking shafts and working underground. It resembles quarrying. *See* STRIPPING; STRIP MINING; QUARRYING.

**OPERA**, or drama set to music, consists of a formal story, in which action is expressed by recitatives, arias, choruses, duets, trios, etc., sung to an accompaniment of full orchestra, and heightened by scenery, costumes, lighting, and other stage effects. One group of writers claim for opera an origin in early Greece, and identify Æschylus and even Sophocles as the first librettists. The Greeks, however, were given only to chorals, and their limited instruments could not produce more than incidental music for their drama. It is more correct historically to place the origin of the music-drama in Renaissance Italy of the 16th century. Late in that century a coterie of music amateurs began discussions at the home of Comte di Vernio, of a new form, the *cantata*, in which the voice was accompanied by one instrument. Among this group were Jacopo Peri and Giulio, who began to compose flute accompaniments to simple songs. In 1602 certain of these songs were published as *Le nuove musiche*. It now became apparent that prose, not merely the formal declamation of the Greeks, could be enhanced in meaning and effect when sung and accompanied by music relevant in spirit to the written context. In the fertile period of the Renaissance, experimentation was brief and progress rapid. In 1607 MONTEVERDE's *Orfeo* showed the Italians the added emphasis, color and suspense which song and instrumental accompaniment could lend to the time-worn tale of Orpheus and Eurydice. On this occasion 13 different instruments were used. This and similar early experiments were in monodic form. The aria was the first prop of opera, and in the early 17th century it was commonly used to relieve long recitatives. In that century the greatest contribution to the new music-drama was made by GEORGE FREDERICK HANDEL (1685-1759), who enlarged upon the early conventions of opera, obtaining greater expression in the recitatives and added orchestral color in such works as *Rodrigo*, *Agrippina*, and *Orlando*, to mention only three of his forty operas. An older and popular contemporary was ALESSANDRO SCARLATTI (1659-1725), often described as the link between the early forms of opera and the 18th century romantic music-drama. After 1750 and until Mozart, the progress of opera may be measured side by side with the improvement in all music and in instruments. Fortunately for opera it soon had to stand alone, apart from the conventional drama.

Interest in this new combining form of the drama and music was not limited to Italy and Germany. In England HENRY PURCELL (1658-95) composed operas whose harmonies and melodic peculiarities gave added evidence that music could be articulate. In his *Dido and Aeneas* there was no spoken dialogue. In a few years CHRISTOPH WILLIBALD GLUCK (1714-87) in Germany made technical improvements, notably in the use of orchestral effects to "point up" the action of the book or libretto. An example of Gluck's technical advances and of the variety he achieved in the recitatives is his *Iphigenie en Aulide*, first produced in 1774 at Paris. The next important contributor to

opera and the first great opera composer in the modern sense was WOLFGANG MOZART (1756-91). Hitherto composers of opera had considered their librettos as secondary, and the librettists they employed were in too many instances literary hacks who wrote couplets at a specified rate. Music-drama made a great forward stride when Mozart pronounced his conviction that drama, not music, was the primary consideration in opera. He had a wide knowledge of dramatic values, as *Don Giovanni*, *The Magic Flute*, and the *Marriage of Figaro* attest, and the creations of his musical genius and dramatic ingenuity are sometimes said to have laid the foundation upon which nineteenth-century opera rested. Early in the latter century German composers began to spread a coat of convincing detail over the rich surface of Italian operatic melody. The effect was healthy, and tended to save opera from fatal transgressions of the elementary rules of drama. Soon after Mozart's death the first works were produced of a prolific Italian composer, Luigi Spontini (1774-1851), while another Italian, GIOACHINO ANTONIO ROSSINI (1792-1868), showed marked originality in instrumentation, if not in plot, in the *Barber of Seville* and *William Tell*. Now for the first time in its history opera was given adequate scenery. The 19th century was the golden era of "grand" opera composition, and that era may be said to have begun in Germany with the works of CARL WEBER (1786-1826), who composed three masterpieces, *Der Freischütz*, *Euryanthe*, and *Oberon*, and those of GIACOMO MEYERBEER (1791-1864), whose chief operas are *Robert the Devil*, *Les Huguenots*, *Le Prophète*, and *L'Africaine*. Meanwhile the Frenchman CHARLES GOUNOD (1818-93) gave a fresh vocal and instrumental dexterity to the music-drama with *Faust*, which had a sentimental and refining influence on other French composers, notably CHARLES THOMAS (1811-96) and JULES MASSENET (1842-1912). The Italian genius for melody, which had been somewhat restrained by the austerities of German composers of operas and other musical forms, captivated Europe by way of the works of GIUSEPPE VERDI (1813-1901). *Rigoletto*, *Il Trovatore*, *Aida*, and *Otello* were each characterized by rich melody and ingenious instrumentation, which again were heightened by the mechanical improvements during the 19th century in brasses and woodwinds. In contrast to this highly melodious, if occasionally florid and sentimental, music of the school of Verdi, Germany produced the dynamic RICHARD WAGNER (1813-83), who brought to opera an unprecedented vigor both in story (he was his own librettist) and in music. Beneath the surface progression of his works the listener may picture the death-struggle, in the composer's day, between romanticism and mechanized utilitarianism. Thus *Der Ring des Nibelungen*, comprising *Rheingold*, *Die Walküre*, *Siegfried*, and *Götterdämmerung*, brought a philosophical quality to the music-drama. His operas remain even in the 20th century the most heroic achievement in the field of music-drama. Wagner's influence upon his contemporaries and even upon com-

posers of the present day is incalculable, and after half a century remains a subject of study and controversy. Although composers were deeply in debt to his genius the inevitable reaction set in after his death. In France CLAUDE DEBUSSY (1862-1918) presented novel orchestral colors for opera in his music for Maeterlinck's *Péleas et Mélisande*, described as the "summit of musical impressionism" at its first performance in 1902 at Paris. In Italy GIACOMO PUCCINI (1858-1924) was an enormously popular and faithful disciple of Verdi, and *Manon Lescaut*, *La Bohème*, *Madama Butterfly*, and *Tosca* were eventually included in the repertoires of opera-houses throughout the world. RICHARD STRAUSS (1864- ) in Germany displayed a particular technical brilliance in *Salomé*, *Electra*, and *Der Rosenkavalier*. In the first third of the present century there were ambitious efforts in all countries to bring the voice, orchestra, and action of opera into closer technical union, but there were scarcely any significant steps toward making the drama, or theme, express a relation to present-day life, as manifested in other musical and dramatic forms of the times. Consult the descriptions of the standard operas treated in individual articles. See also LIBRETTO; MUSIC; Structure.

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**OPERA GLASS.** See BINOCULAR INSTRUMENTS.

**OPHELIA**, the tragic heroine of Shakespeare's *Hamlet*. When Hamlet, with whom she is in love, kills Polonius, her father, mistaking him for the king, Ophelia goes mad and drowns herself.

**OPHITES** (from the Greek, *ophis*, serpent), an obscure Gnostic sect which regarded the serpent as an object of reverence. The name Ophites was originally given to a particular sect of the 2nd century, but was later extended to a number of Gnostic sects possessing similar beliefs. According to the Ophites, man was created by seven archons, identified with the planets, the chief of which is Ialdabaoth, or Jehovah, the Demiurge, who breathed the spirit into Man. But Ialdabaoth grew jealous of the man he had created, and wishing to keep him in bondage, forbade him to eat from the tree of knowledge. Then came the good serpent, sent by Sophia, Wisdom, who persuaded man to disobey the Demiurge and taste the forbidden fruit. Disobedience of Ialdabaoth's decrees was the highest duty of all men.

Among the Ophite sects were the Cainites, Perates, Sethians, the Gnostics of Irenaeus, and the Naassenes. It is believed that the Ophites represent primitive GNOSTICISM.

**OPHIUCHUS** (gen. *Ophiuchi*), the snake-carrier, a large constellation south of Hercules. It consists roughly of a number of stars of the third magnitude forming an oval surrounding a region comparatively devoid of stars. The southern portion of the constellation is near the Milky Way and very rich in variable stars, star clusters and dark nebulae. See STAR; map.

**OPHTHALMIA.** See EYE, AFFECTIONS OF.

**OPHTHALMOLOGY**, that branch of the medical sciences which deals with the anatomy, function, and diseases of the eyes. Probably the earliest recognition of this specialty is to be found in the Egyptian PAPYRUS EBERS, of about 1650 B.C., a document of 110 pages of which 8 were devoted to diseases of the eyes and their cure. That was the starting point of the era of ophthalmology in which the diseased condition was recognized in a general way, but without knowledge of the underlying anatomy. The absolute cures so gravely proposed by the authors of that period ring most fantastically in our modern ears, including as they do lizard blood, human milk and excreta, metals of all sorts and incantations.

The adolescence of ophthalmology started about the time of Galen, who died in 210 A.D. During that period, a knowledge of the anatomy of the eye was developed, from which arose a better recognition of the actual disease conditions. In the later part of the period, the laws of the physics of light and the application of such laws to the eyes were developed.

Ophthalmology attained young manhood at the close of the first third of the nineteenth century, when the father of the present day science, von Graefe, was in his prime. During the past hundred years, progress has been rapid, aided to a great extent by the development of instruments of precision for use in recognition and treatment of ophthalmic disease. Although there still remains much to be learned, ophthalmology is to-day probably the most advanced of the medical sciences, due to the free visibility of the eye and to the fact that the efforts of a large number of investigators are concentrated upon a comparatively small area.

There are three fundamentals upon which the science of ophthalmology is based: anatomy, function, and diseases of the eye. The *anatomy* embraces not only the gross structure of the eyeball as it can be seen with the unaided eye, but also the structure and relationships of the surrounding structures. The bones of the skull that unite to form the socket, must be familiar to the ophthalmologist. The lining membranes of the socket, the structures contained in the socket funnel, the arteries, the veins, the nerves, and in fact, every tissue within reaching distance must be intimate friends of the eye physician. Then he must know how all of these structures appear under the microscope, even to the most minute cell and not only must he know them as they are in the adult, but he must also be able to recognize them at any stage of their development in the embryo. This is specialized knowledge that must be acquired after the general knowledge of gross and microscopic anatomy. The brain and its prolongation, the optic nerve, must also be studied by the ophthalmologist.

The second pillar is the *function* of the eye or, better, the eyes. For an understanding of this phase, a thorough knowledge of the physics of light is absolutely essential, to which must be added a comprehension of organic chemistry plus a working acquaintance with psychology. The passage of rays of light

through the various structures of the eye until they reach the perceiving elements is a complex path. The transposition of light, both white and colored, into nerve impulses and the recognition of such impulses by various centers of the brain forms a chapter in itself. Again, the rotation of the eyeball in the socket under the influence of the various muscles that are attached to the eyeball and the simultaneous motion of the two eyeballs requires careful analysis and understanding.

The third pillar deals with *diseases of the eye* and surrounding tissues. Such diseases may be a local injury or inflammation, requiring a general knowledge of bacteriology and demanding a local treatment, either medical or surgical. Again the disease may be a local inflammation or degeneration that is merely the manifestation of some systemic disorder. In the majority of cases, the ophthalmologist merely coöperates with the general physician, using such local measures as may be applicable. Much of the work of an ophthalmologist deals with the correction of errors of refraction, specifically the fitting of glasses, and it is particularly here that a thorough understanding of the three pillars is essential.

With all this in mind, it can be seen that ophthalmology is a highly specialized branch of medicine and that an ophthalmologist must be primarily a graduate physician with a good understanding of general medicine and surgery, to which has been added a specialized study of the eye. *See also EYE, ANATOMY OF, and AFFECTIONS OF.* H. S. G.

**OPITZ VON BOBERFELD, MARTIN** (1597-1639), German poet, was born at Bunzlau in Silesia, Germany, Dec. 23, 1597. He became a student of the University of Frankfurt-on-Oder in 1618, and in this year published his first important work, an essay entitled *Aristarchus or Contempt for the German Language*. In 1619 he became the leader of the so-called First Silesian School of poets, and thereafter was looked up to as the "father of German poetry." After a short term as Professor of Philosophy at Weissenberg, Transylvania, Opitz embarked on the life of a wandering court poet. In 1635 he became the historiographer of the King of Poland at Danzig. One of his most famous works is the *Book of German Poetry*, 1624, a treatise on the art of poetry in eight short chapters. This imposed a standard on the composition of German verse for the next 150 years. The poetry of Opitz himself is generally considered conventional and uninspired. The poet died of the plague at Danzig, Aug. 20, 1639.

**OPIUM**, a drug obtained by cutting the unripe fruit of the opium poppy and collecting the dried exudate. The actions of opium are complex, and are the results of the twenty-five alkaloids that it contains. Approximately 10% is MORPHINE, the other alkaloids being present in a considerably smaller quantity. Accordingly, its actions resemble those of morphine, except that it is more constipating. Its chief uses are for the relief of pain, the allaying of irritation (whence its inclusion in cough mixtures),

and in combinations for breaking up colds. Laudanum is tincture of opium; paragoric is tincture of opium and camphor.

Opium is smoked by the Orientals for the pleasurable sensations which they derive from it. Among Occidentals, however, the state of euphoria is not manifested, as a rule. Continued use can lead to the development of an addiction which is practically impossible to break. In the present day, morphine addiction is more common than opium addiction, owing to the more frequent therapeutic use of morphine and its more concentrated nature.

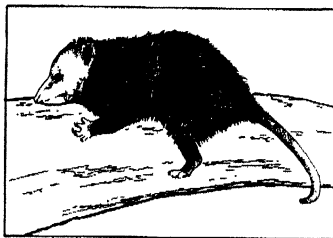
**OPIUM WAR**, the war between Great Britain and China, 1839-42, which followed a long series of difficulties arising out of foreign and particularly British trade expansion in China. The immediate cause of the declaration of hostilities by Great Britain was the burning of a substantial amount of opium by the viceroy in Canton in an effort to enforce the prohibition against the import of this drug; but there had been, prior to this time, friction between the Chinese and the British. This was the first open war between China and any modern western nation, but by no means the first armed clash. The British won comparatively easily. A peace treaty was signed at Nanking in 1842. This ceded Hongkong to Great Britain, cancelled the prohibitions against import of opium and formally opened Canton, Amoy, Foochow, Ningpo and Shanghai to foreign trade.

**OPORTO** ("The Port," Portuguese *Porto*), next to Lisbon, the most important city in Portugal, "the loyal and invincible city," is picturesquely situated on the steep bank of the Douro River about 3 mi. from the Atlantic Ocean. In the highest part of the city is the cathedral founded by Count Henry, built in Romanesque style in the 12th century, but later altered in Gothic. There are other interesting churches and many fine buildings, squares and monuments. Among the various educational institutions are the university founded in 1911 and the industry and trade school opened in 1924. The chief manufactures are textiles, metal goods, furniture, cork, leather, soap, candles and jewelry. Wine is the principal export, but cork and ores are also sent to other markets and raw materials of all sorts are imported. Oporto is the seat of a bishop and has museums and scientific societies. It publishes over 30 newspapers, but 42% of the inhabitants are illiterate. Pop. 1930, 227,595.

**OPOSSUM**, a marsupial animal several species of which are found from the United States southward through South America. The species vary in size from those as small as a mouse to some larger than a cat. All are characterized by a long pointed nose and a scaly prehensile tail.

The true opossum of the United States (*Didelphis virginiana*) is usually a dirty yellow-gray in color and the fur is generally dyed for market. The young, 6 to 18 in a litter, produced by the female in the spring, crawl into her pouch and are carried until able to take care of themselves. Sometimes young opossums hang to the tail of the mother by their own tails.

These animals are common in the southern United States and their flesh is much relished in season. When attacked they feign death; from this habit comes the expression "playing 'possum."



Some of the opossums of South America and the so-called opossum of Australia differ in many ways from the true opossum.



AUSTRALIAN OPOSSUM

**OPPELN**, a German city, in Upper Silesia on the Oder River about 51 mi. southeast of Breslau. Since 1922 it has been the capital of the province. It has three churches, one of them founded by St. Adalbert, an old royal castle and a fine rathaus and government building. Its industries include the manufacture of machinery, cement, grain products and cigars. The city also has river shipping. First mentioned in 1000, it was capital of the duchy of Oppeln from 1163 to 1532, then became Bohemian and in 1742 fell with Silesia to Prussia. Pop. 1925, 41,507.

**OPPENHEIM, E. PHILLIPS** (1866- ), English author, was born in 1866 and educated at Wyggeston Grammar School, Leicester. He is the author of a long list of novels of romance, intrigue and adventure. The best known of these are *The Master Mummer*, *A Prince of Sinners*, *The Conspirators*, *Mr. Grex of Monte Carlo*, *The Great Impersonation* and *The Million Pound Deposit*.

**OPPIAN**, Greek poet, was born in Cilicia in the 2nd century A.D. There is much vagueness about his life, though it is known that he was the son of a philosopher and died young. His poem *Halieutica*, on the habits of fish and the different ways of catching them, was dedicated to MARCUS AURELIUS. He is not to be confused with another poet who wrote

on the chase and whose inferior work has been ascribed to Oppian. The latter's style was elegant and if, at times, he overelaborated, he generally had the gift of neat description and by his precision showed himself a naturalist.

**OPPOSITION**, the term applied to an object in the heavens when it is opposite the sun as seen from the earth.

**OPS**, in Roman mythology, the goddess of productivity, sometimes identified with CYBELA. Her place of worship was on the island of Crete.

**OPTICAL GLASS**. A glass which differs from ordinary glass in that it has greater freedom from heterogeneities and optical absorption (*see* ABSORPTION OF LIGHT). Freedom from absorption is obtained by the melting of very pure materials in pots which show little tendency to dissolve in the melted glass. During melting, the glass is thoroughly stirred in order to secure an uniform mixture. After melting, the glass is allowed to cool in the pot, the pot being broken to remove it. After all defective portions of glass have been eliminated, the resulting irregularly shaped pieces may be softened and pressed to desired shapes in iron molds. The pressed blanks are then carefully annealed and are ready for finishing as LENSES or PRISMS. For optical purposes, many different types of glass are required which differ in index of REFRACTION and DISPERSION. Among the principal types are ordinary crown, borosilicate crown, barium crown, light, medium and heavy flints and barium flint.

I. C. G.

**OPTICAL INSTRUMENTS**. These instruments may be classified according to their uses as: 1. aids to the human eye; 2. instruments for producing pictures of objects; 3. instruments useful in making various measurements.

In the first group, **TELESCOPES** make it possible to see objects so far away that the eye by itself cannot distinguish their form or even detect them in many cases. Field-glasses, prism binoculars, opera-glasses (*see* BINOCULAR INSTRUMENTS) and PERISCOPES, are chiefly used to produce enlarged images of objects nearer by, thus increasing the detail visible. Then come simple MICROSCOPES and reading-glasses to aid in enlarging the retinal image of nearby small objects, and, finally, compound microscopes to enable the eye to see objects so small that they would ordinarily be entirely invisible or indistinguishable. **SPECTACLE LENSES** are instruments which correct defects in the eye itself.

The second group comprises cameras (*see* CAMERA, PHOTOGRAPHIC) and projection LENSES of all kinds.

The third group contains various types of instruments. The immutable WAVE-LENGTH of spectral lines may be employed in INTERFEROMETERS to measure small distances extremely accurately. Other optical instruments measuring distances are the RANGE FINDER and the telemeter. Directions and angles are measured by TRANSITS, THEODOLITES, GONIOMETERS and SPECTROMETERS. Polarized light (*see* POLARIZATION OF LIGHT) is utilized for measuring sugar-content of solu-

tions and glaze of surfaces, using polarimeters and saccharimeters. Light-intensities are measured by PHOTOMETERS, and colors by CHROMATOMETERS and COLORIMETERS.

While some of the simpler optical instruments are easily constructed, high-grade instruments require great care and skill in design, selection of material and in the working and assembling of optical parts. Otherwise, imperfections in the image will result which decrease the ability of the instrument to distinguish individual objects, thus reducing its definition and RESOLVING POWER. Faulty design and construction may also be responsible for excessive loss of light in the instrument itself, so that the images are too faint. Some of the most perfect plane surfaces known have been produced for use in interferometers. These are plane to within a small fraction of a wave-length of visible light. See also OPTICAL GLASS. T. S.

### OPTICAL INTERFERENCE PHENOMENA.

See INTERFERENCE OF LIGHT.

**OPTICAL PYROMETERS**, an apparatus for measuring the temperature of a hot body by the light which it emits. As its temperature is raised, any object gradually becomes luminous and both the COLOR and the intensity of the light change. Even the unaided eye is able to estimate temperatures approximately. "Dull red heat" corresponds to about 500° C., "cherry," to about 750° C., and "white heat," to approximately 1200° C. In principle, any optical pyrometer is a device by which light from a standard source is compared, either in intensity or in color, with that from the hot body.

In using one type, the Wanner or the Scimatco, the operator, on viewing the hot body through a sort of TELESCOPE, sees a bright disc divided into two halves which at first are unequally bright. The light for one half comes from the hot body while that for the other half comes from a small electric light mounted in the instrument. The optical system is complicated, but the net result is that these two beams of light are polarized (see POLARIZATION OF LIGHT) at right angles to each other. By rotating a Nicol PRISM in the eye-piece, one half of the field is diminished in intensity while the other is enhanced. When the line of separation between the halves vanishes, the intensities are equal, and the temperature of the hot body can be read from a scale on the eye-piece.

Another type of instrument, e.g., the Leeds and Northrup or Holborn-Kurlbaum, consists of a short telescope containing a small incandescent lamp so mounted that its filament lies in the focal plane of the objective. In using this instrument, the telescope is pointed at the hot body and the current through the lamp is adjusted until the tip of the filament just disappears against the bright background of the light from the hot body. When properly calibrated, the temperature is given in terms of the current through the lamp filament for this adjustment.

Optical pyrometers cannot be used satisfactorily for temperatures below 600° C., and they are not very sensitive as low as that. By using neutral absorbing

screens to cut down the light from the hot bodies, the high-temperature range can be extended indefinitely. For very high temperature work, optical pyrometers possess the advantage that a calibration made with lower temperatures can be extrapolated safely to higher temperatures by applying the laws of RADIATION OF HEAT. Optical pyrometers have the disadvantage that they cannot easily be arranged for automatically recording temperatures, since the readings always involve some sort of photometric matching. Recent improvements in PHOTO-ELECTRIC CELLS, however, indicate that probably this difficulty can be overcome if desired. Unless especially calibrated, optical pyrometers, like RADIATION PYROMETERS, indicate "black body" temperatures (see BLACK BODY RADIATOR). W. W. S.

**OPTICAL ROTATION.** When plane-polarized light (see POLARIZATION OF LIGHT) is allowed to pass through certain substances, the plane of polarization is rotated through an angle which is proportional to the length of the path through the substance. Substances in which rotation takes place are said to be optically active. Mica, quartz and many other crystals show the effect markedly. Solutions of some substances, such as sugar, are also optically active. In this case, the angle of rotation may be evaluated by the equation,  $\theta = kcl$ , where  $c$  and  $l$  are concentration and length of the column and  $k$  is a constant depending on the nature of the substance. The rotation may be right-handed or left-handed, *dextrogyrate* or *laevogyrate*, depending on whether the molecules are arranged in a clockwise or counter-clockwise direction. In a solution of dextrose, where the rotation is right-handed, the atoms in the molecule are arranged in one way, whereas in a solution of levulose, where the molecule is the same, the atoms are arranged in the reverse way. The determination of sugar content, saccharimetry, in solutions depends on optical rotation.

**OPTIC NERVE, DISEASES OF.** See BLINDNESS, MEDICAL ASPECTS OF; EYE; EYE, AFFECTIONS OF.

**OPTICS**, the science which treats of the laws and properties of LIGHT and vision (see EYE). In GEOMETRICAL OPTICS, light is considered as propagated along rays which are reflected and refracted as they pass from one medium into another. From the laws of REFLECTION and REFRACTION, methods for the design of optical systems are developed.

Physical optics deals with the nature of light. It includes the phenomena of propagation, reflection, refraction, DISPERSION, polarization, DIFFRACTION, interference, absorption, radiation and theories of the nature of light. In physical optics, the term light is commonly extended to include the invisible as well as the visible radiation, and, hence, physical optics includes the study of the phenomena of infra-red, ultra-violet and röntgen rays. Many of the important developments of modern physics, especially of atomic structure, trace their origin to the study of radiation and the allied phenomena of physical optics. (See POLARIZATION OF LIGHT; INTERFERENCE OF LIGHT; ABSORPTION OF LIGHT; RADIATION, THEORY OF.)

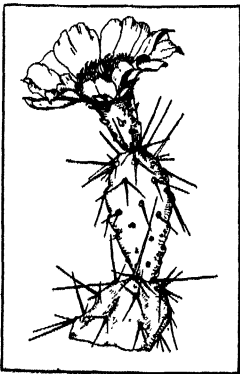


Physiological optics treats of vision and includes theories of vision and the study of the optical characteristics of the eye. See also OPTICAL INSTRUMENTS; OPTICAL GLASS. I. C. G.

**OPTIMISM**, in philosophy, a point of view holding to the goodness of the world and of man, the opposite of pessimism. The philosophy may take a number of different forms: it may consider either that the world is good or that it may be made better; that man is good or that human nature can be improved. In its attitude toward the future it becomes **MELIORISM**. Optimism may thus be either metaphysical or ethical, the one applying to ideas concerning the goodness of the world, the other to those concerning the goodness of man.

Metaphysically, optimism has found its most excellent expression in the Leibnizian phrase, "This is the best of all possible worlds." Ethically, optimism is best represented by JEAN JACQUES ROUSSEAU, who believed that man is inherently good by nature. In this belief CONFUCIUS antedated Rousseau by many centuries. PLATO, in holding that all things tend to the good, and in making the Idea of Good central in his scheme of Ideas, is an exponent of metaphysical optimism.

**OPTOPHONE**, an instrument which enables the blind to read ordinary printing by sound. A SELENIUM CELL, the electric RESISTANCE of which varies with the intensity of the LIGHT to which it is exposed, is placed in an electric circuit containing a TELEPHONE and battery. When a periodically interrupted beam of light falls upon the cell, a musical note is heard in the telephone. When a number of such beams are used, each interrupted at a different FREQUENCY and focused upon a particular portion of the printed line, the passage of a letter produces a characteristic sound. The blind reader learns to identify each sound with a particular letter, and to recognize words in the succession of sounds as the beams of light are passed along the printed line. P. E. S.



P. A. RYDBERG "FLORA OF PRAIRIES AND PLAINS"

UTAH PRICKLY PEAR  
*Opuntia rufida*

**OPUNTIA**, a large genus of usually very spiny, many-jointed plants of the cactus family, numerous species of which are commonly called prickly-pear. There are probably 250 species native chiefly to North and South America, ranging from Massachusetts to British Columbia and southward to Patagonia. More than 50 are found in the United States, chiefly in the southwest, 26

occurring in California. A few naturalized species have become abundant in various parts of the Old World. Several species are used for hedges or as forage for grazing animals, others are employed

in ornamental planting and one, the Indian fig (*O. Ficus-Indica*), is extensively cultivated in warm countries for its edible fruit. In size and habit they vary from small prostrate forms to large widespreading shrubs and even to trees 25 ft. high. The leaves, usually very small, fall away early, the green bark functioning as leaves. The large showy flowers, varying from green to red or yellow, are borne singly on the upper parts of the joints; the fruit, a large, more or less spiny berry, is often edible.

**ORACH** (*Atriplex hortensis*), called also French spinach, a tall annual of the goosefoot family. It is a native of Asia widely cultivated, especially in Europe, as a potherb. The plant grows about 5 ft. high with furrowed stems, rather soft, arrow-shaped leaves and very small flowers borne in crowded clusters. The tender young leaves and shoots are used like spinach. Orach is very sparingly grown in the United States.

**ORADEA-MARE**, or **GROSSWARDEIN**, Hungarian Nagyvarad, city in the west of greater Rumania, until 1919, is beautifully situated on both banks of the Koros River. Among the 17 churches are the Greek Catholic and Roman Catholic cathedrals; several cloisters, law and pedagogical institutes, theological seminaries, and the city hall are found here. There are fine parks, an archeological and fine arts museum and learned and other societies. Trade in agricultural products is brisk. The bishopric was founded by King Stephen I of Hungary. As the burial place of Hungarian kings the city was important in early times. Destroyed by Tartars in 1241 and by the Turks in 1474, it was later in possession of the Turks from 1660 to 1692. Of the inhabitants 40% are Hungarian and 20% Rumanian. Est. pop. 1930, 82,355.

**ORAN**, Africa, a fortified Algerian seaport, capital of the department of Oran. It is situated on the Mediterranean coast on the side of the Jebel Murjaja, 1,900 ft. high, between 35° 44' N. lat. and 0° 39' W. long. Enclosed by walls, the town is composed of two portions, divided by what was once the Wad Rehhi ravine, and which is now covered by structures and streets. On the west side of the ravine is the ancient deserted Spanish town; on the east the modern French town with its wide streets and fine houses. There are a number of important buildings such as the mosque, Catholic cathedral, museum, library and the Chateau-Neuf. Railways connect the town with Algiers, Ujda, Sidi-bel-Abbes, and Colomb-Bechar-Kenadsa. The new harbor, with a depth of 30 ft. and an area of 100 acres has been a decisive factor in the increase of trade. The climate is extremely hot but healthy, and the town is frequented and inhabited by numerous Europeans who make up most of the total population. Wine, cigarettes, agricultural produce, hides, iron ore and esparto grass comprise the chief exports. Pop. 1926, 150,031.

**ORANGE**, a long lived evergreen tree of the rue family, one of the most anciently cultivated of fruits. Its original home is thought to be Indo-China, but it has been widely planted in warm climates and has



run wild in many regions. The first permanent settlers in Florida found it already established, probably from seeds or plants brought from Spain.

There are three principal species of oranges in cultivation. 1. King (*Citrus nobilis*), a native of Cochinchina brought to Riverside, Cal., in 1880 by Mrs. S. R. Magee and grown more or less in gardens ever since for its large, rough-skinned, very juicy, vinous-flavored fruit. The mandarins and tangerines are notable for their loose skin which with their medium size and pleasant flavor make them highly popular as dessert fruits. The Satsuma or Unshiu oranges, small fruited varieties, are grown largely in Japan for their very juicy, peculiarly, but agreeably, flavored fruit. Since its introduction into Florida in 1876, the Satsuma has been grown in the gulf coast states where it has proved one of the hardiest of edible citrus fruits. The tangerine was hybridized with the grapefruit in 1897 by Walter T. Swingle of the U.S. Department of Agriculture to produce a remarkable group of varieties known as tangelos. 2. The sour or Seville orange (*C. Aurantium*) is extensively grown in Spain and shipped to the British Isles where it is largely used for making marmalade. In Florida the Seville is grown in home gardens and in orchards as a stock on which to bud other citrus fruit trees. 3. The sweet orange (*C. sinensis*), the most widely cultivated of all species, is rather tender to frost but harder than its close relatives, the lime and the lemon. In both tree and fruit it has varied greatly under domestication. The most conspicuous of its variations is the unexplained development of a secondary axis, which gives the fruit of certain varieties its navel appearance. The first trees exhibiting this peculiarity to attract attention in America were imported in 1870 by William Saunders of the U.S. Department of Agriculture and distributed to various orange growing localities.

Other species of less importance include the Calamondin orange (*C. mitis*), a native of the Philippine Islands and popularly cultivated in Hawaii under the erroneous name of China orange. The U.S. Department of Agriculture introduced it from Panama and nurserymen distributed it under the incorrect name of to-kumquat. Since it is harder than either the sweet or the sour orange it may be grown in home gardens in states bordering the Gulf of Mexico. The Bergamot orange (*C. Bergamia*) is largely grown in Calabria and southernmost Italy for the essential oil expressed from its peel to make Eau de Cologne and other scents. The Otaheite orange (*C. taitensis*), probably of hybrid origin, is popular among florists as an ornamental pot plant.

Seven hybrid varieties between the common orange and the trifoliate orange were made in 1897 by Swingle and named citranges. They are hardy in most of the cotton belt where they are valuable as home garden fruits and ornamentals. The trifoliate orange (*Poncirus trifoliata*), formerly classed with *Citrus*, is a small spiny deciduous tree native to north China, extensively used for stocks on which to bud

oranges. Being hardier than other oranges it is also used for specimen plants and hedges as far north as Philadelphia, Pa. In addition to the countless "pure blood" varieties of these various species and the hybrid already mentioned another important hybrid between the common lime (*C. aurantiifolia*) and the round or oval kumquat (*Fortunella margarita* or *F. japonica*) was produced by Swingle in 1909 and called the limequat.

Until recent years Mediterranean countries, especially Spain and Italy, shipped quantities of oranges to the United States and Canada. Now, however, our markets are supplied by our own orchards in three principal regions: central to southern Florida, the Mississippi Delta and California. Climatic conditions in and near the Rio Grande Valley also favor this fruit. In the early Florida culture oranges were propagated from seed, but market demands have forced the more reliable practice of budding which reproduces varieties true to name. Various stocks are used to adapt the trees to varying types of soil and degrees of cold, though none make them fully hardy to frost. Two year old trees are usually planted at distances apart that vary with the normal sizes of the full grown trees, usually from 10 to 30 or 40 ft.

Clean cultivation, and, in California, irrigation, are essential during the growing season. When properly managed the trees live to great age. Blossoms, green and ripe fruit often appear on the trees simultaneously. At harvest the fruits are cut off by hand, stored a few days to dry and soften the skins, cleaned and graded by machinery and packed in boxes containing 2 cu. ft. When carefully handled oranges keep for several months.

The most dreaded enemy of citrus fruit growing is frost which, depending upon its intensity, may destroy blossoms, foliage, twigs, branches or even the trees. Protective sheds and tents have been discarded because they are too costly and reduce fruitfulness, but banking the trunks with earth in exposed situations is still practiced to some extent. Orchards are sometimes flooded where abundant water is available. The most successful and widely practiced method in American orchards, however, is by heat, generated by wood, coal or oil, the last being preferred because of its convenience, low cost and, when properly regulated, its freedom from soot. Small fires and many of them have proved more effective than fewer larger ones. When adequate numbers are used they often maintain a temperature of 10° above that of the neighborhood and thus prevent damage.

#### ORANGE PRODUCTION, U.S.

5-Year Average, 1926-30		
Division		Production
LEADING STATES:		
California .....	29,414,000	boxes
Florida .....	11,440,000	"
Louisiana .....	191,000	"
Arizona .....	88,000	"
Alabama .....	87,000	"
Texas .....	66,000	"

Various scale and other insects attack the orange. Some of these are controlled by their predacious or parasitic enemies, others by spraying and still others by fumigating individual trees with hydrocyanic acid gas. Several physiological, bacterial and fungous diseases also are troublesome. While some are incurable, many may be controlled by spraying and other methods.

M. G. K.

**ORANGE**, an old town in Provence, southern France, about 18 mi. from AVIGNON. It is chiefly celebrated for its Roman remains. Perhaps the most imposing of these are the Triumphal Arch and the Antique Theater. In the latter, plays have been presented every summer by the *Comédie Française*. Pop. 1931, 11,956.

**ORANGE**, a city in Orange Co., southern California, 30 mi. southeast of Los Angeles, served by the Santa Fe Railroad and the Pacific Electric Railway. This irrigated region is noted for its beautiful orange, lemon and walnut groves. Beans, peppers, and dairy products are shipped through the city. The city has large citrus fruit packing-houses and factories producing insulated wire and rope. The popular beach towns, Newport and Balboa, are 14 mi. distant. Orange was founded in 1870 and incorporated in 1888. Pop. 1920, 4,884; 1930, 8,066.

**ORANGE**, a town and village in Franklin Co., northwestern Massachusetts. The village is situated on Millers River, 36 mi. northeast of Springfield and is served by the Boston and Maine Railroad. The town has manufactures of sewing-machine needles, tapioca, water wheels, textile machinery and other articles. There are tracts of pine timber, poultry farms and fruit orchards. Orange became a district by the union sections of Athol, Royalston, Warwick and some common lands in 1783. The town was incorporated in 1810. Pop. 1920, 5,393; 1930, 5,365.

**ORANGE**, a city of Essex Co., N.J., situated near the base of the Watchung Mountains, 4 mi. west of Newark and 12 mi. west of New York City. Its transportation facilities include the Lackawanna and Erie railroads, trolleys and motor bus lines. A residential community, part of the great contiguous Newark metropolitan district, it is also the suburban home of many New York City business men. There are a number of industries located here, the products of which were valued approximately at \$11,000,000 in 1929. The retail business in 1929 amounted to \$16,997,006. Orange was separated from Newark township in 1806 and was granted its charter as a town in 1860; it was incorporated as a city in 1872, and has had a commission form of government since 1914. Pop. 1920, 33,268; 1930, 35,399.

**ORANGE**, a city and inland port on the eastern boundary of Texas, the county seat of Orange Co. It is situated at the head of navigation on the Sabine River, 20 mi. east of Beaumont. Bus lines, steamships and two railroads serve the city. There is an airport. In 1920 oil was discovered in the vicinity. Valuable timber, mainly pine and cypress, surrounds the city. Truck gardening is the chief agricultural

interest. The city has many industries including lumber milling, creosoting, paper and rice milling, food canning, food packing and steel fabricating. A trading post was founded on this site in 1800. The deep water harbor was improved in 1914. Pop. 1920, 9,212; 1930, 7,913.

**ORANGE**, the longest river of South Africa, rising about 200 mi. from the Indian Ocean and traversing the continent to flow into the Atlantic Ocean. It has a length of about 1,250 mi. and drains with its tributaries an area of over 400,000 sq. mi.

The South African river system consists of one great interior basin which drains into the sea by the Orange River, and a number of comparatively short coastal rivers, everywhere unnavigable except occasionally at their mouths.

The Orange is fed from the mountainous country of Basutoland, where it rises in the Drakensberg range, and from the Vaal River which drains the Orange Free State and southern Transvaal. Below its confluence with the Vaal it only occasionally receives water from its tributaries, and in the lower reaches loses more water by evaporation than it receives from the country through which it passes. Consequently the river enters the sea as a comparatively insignificant stream. Although useless for navigation, both the Orange and Vaal are of value in irrigation. After leaving the steep slopes of Basutoland and the eastern portions of the Orange Free State, the Orange River is divided into long reaches between rapids, and below Upington at the Aughrabies Falls makes a plunge of over 400 ft. into a deep gorge.

The Vaal tributary rises in the northern extensions of the Drakensberg, flows south of the Witwatersrand ridge and east of the Kaap plateau, and is joined by the Modder on the left, just before its confluence with the Orange.

In 1777, Captain Gordon, a Dutch officer of Scottish extraction, ascended the river in its middle course and named it the Orange in honor of William V., prince of Orange.

**ORANGE, THE HOUSE OF.** The present reigning house of Holland is known as the House of Orange-Nassau. The first person known to have borne the title of Count of Nassau was Walrum in the 11th century. The first Count of Nassau of note was Engelbert I (1388-1442) who acquired possessions in the Netherlands, the chief of which was Breda. This count, like his successor, Engelbert II, was a staunch supporter of the Burgundian régime. In 1515 Henry, holder of the Dutch possessions of the family, married Claudia of Orange. Their son Rene, Prince of Orange, died without heirs in 1544 and willed his possessions to his cousin, William, who thus after the death of his father became Count of Nassau, Prince of Orange and possessor of the now extensive lands of the House in the Netherlands. He is known in history as William the Silent and is famous for his leadership of the Dutch in their struggle for independence from Spain. He was a favorite of Charles V and fought with him against

the German Lutheran princes, but after the policy of religious persecution of Philipp II had aroused the Dutch he became their leader. His great military talent was used whole-heartedly for their cause until his assassination in 1584. His son Maurice, who succeeded to his position of leadership, at length secured the *de facto* independence of the northern Netherlands, and was real ruler until his death in 1625. His brother Frederick Henry inherited his lands and political importance, including the title of Stadtholder, which Rene and his successors had held.

Frederick Henry's son, William II, was Stadtholder from 1647-50, and it was during his reign that the independence of the Netherlands was finally recognized in the TREATY OF WESTPHALIA. He married a daughter of Charles I of England, but died 11 days before the birth of their son, later William II. Until 1672 Holland was without a Stadtholder, De Witt being the most prominent person in politics; but in that year war with France broke out and the popular demand for the recognition of the young Orange prince as Stadtholder (William III) was granted. Upon the abdication of James II of England in 1688, William and his wife, Mary, daughter of James, were called to the English throne. William's life was occupied with strenuous resistance to the encroachments of Louis XIV. He died childless in 1702, and there was no Stadtholder until 1747 when his nearest relative became Stadtholder as William IV, and the position was made hereditary in the House of Orange-Nassau. His son, William V, held the position until 1795 when he was driven out of Holland by the French revolutionary army. In 1814 his son returned and ascended the throne of the United Netherlands, created after the overthrow of Napoleon, as King William I. William I abdicated in 1840. Later sovereigns of the Kingdom of the United Netherlands have been: William II, 1840-49; William III, 1849-90, and Wilhelmina, 1890.

**ORANGEBURG**, a city and the county seat of Orangeburg Co. in south central South Carolina, situated on the North Edisto River, 48 mi. southeast of Columbia. Bus lines and two railroads serve the city. Cotton, grain and hogs are the chief products of the district. The principal manufactures include lumber, cotton and canned goods. The city dates back to 1700 and the vicinity was the center of active operations in the American Revolution. Orangeburg was incorporated in 1882. Pop. 1920, 7,290; 1930, 8,776.

**ORANGE-DOG CATERPILLAR**, the larva of the giant swallow-tail, *Papilio cresphontes*. This is a southern species which feeds on leaves of citrus fruits. The caterpillar is a blotched brown and white creature somewhat resembling bird excrement. When disturbed, it puts forth a pair of long yellow, horn-like organs just behind the head. These give off a very disagreeable odor. The adult is a magnificent butterfly, its black wings conspicuously banded with yellow.

**ORANGE FREE STATE**, a province of the UNION OF SOUTH AFRICA, lying between the Orange

and Vaal rivers, bounded on the north by the Transvaal, south and west by the Cape of Good Hope, east by Natal and southeast by Basutoland. Area 49,647 sq. mi.

Except for a small area in the west, the province is high veld, a vast treeless rolling plateau of grass, over 4,000 ft. above sea level. Pine, gum and wattle (mimosa) trees have been planted. Many cattle, horses, sheep and goats are reared. The Caledon River flows for a considerable distance in the east and the Riet is used for irrigation to the south of Bloemfontein. The valley of the Caledon has wheat areas. In the northern part of the state is the famous "maize triangle" which produces about half the total crop of the Union. Changing fashions almost ruined the ostrich breeding industry, although in 1931 it was reported on the increase again. The locust pest has assumed alarming proportions in recent years. Swarms swoop down in dense clouds to eat leaves and grass over hundreds of acres.

In certain localities minerals are exploited. Jagersfontein is the diamond center and Kroonstad and Bethlehem are in rich maize and tobacco areas. Along the Vaal River are coal fields. Bloemfontein is the administrative center of the province.

Primary and secondary education and the training of teachers are controlled and financed by the province. Education is free and compulsory for children between the ages of 7 and 16. The two official languages, English and Afrikaans, are taught to all pupils, unless parents object.

The country was first settled in 1835 by the Dutch. To put a stop to Boer outrages upon natives, Great Britain annexed the colony in 1848. Six years later it was recognized as an independent state. During the Boer War it joined the South African Republic, but in 1900 was proclaimed a British colony under the name of Orange River Colony. It became a member of the Union under its original name of Orange Free State. Pop. 1921, 628,827, consisting of 188,556 Europeans, 17,898 mixed, as the result of intermarriage of white settlers and natives, 421,978 natives and 395 Asiatics. Est. pop. 1930, Europeans, 214,172.

**ORANGE FRUIT FLY**, or morelos, a pest which often plays havoc with citrus fruits. It is the larva of a fly of the family *Trypetidae*, which is native to Mexico. The female lays eggs on immature fruit. The maggots bore through the rind and make tunnels through the pulp which they spoil. Because of its destructive habits its introduction into the United States has long been feared by American orange growers.

**ORANGEMEN**, members of a secret organization, the Orange Society, which was founded in northern Ireland to commemorate the victories of WILLIAM III and to maintain the ascendancy of Protestantism.

**ORANGE SCALE**, any one of a dozen species of scalebugs (*Coccidae*) which feed upon orange. Shortly after birth they become fixed for life in their position and protected from their enemies by waxy or cottony secretions. The young crawl from beneath

these protections to other parts of the trees to repeat the cycle. Scale bugs reproduce so rapidly that unless checked by their natural enemies or man they often kill the trees which they attack.

**ORANGE SOCIETY.** See ORANGEMEN.

**ORANG-UTAN**, a large anthropoid ape (*Pongo pygmaeus*), nearest to man in brain and several other points of structure. The orang-utan is confined to the lowlands of eastern Sumatra and the forests of Borneo. A large male may reach  $4\frac{1}{2}$  ft. in height when stand-



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ORANG-UTAN

ing erect, which this animal finds it difficult to do; the female is smaller. The naked face is broad, with widely expanded cheeks, protruding jaws, a large mobile mouth, and formidable teeth. The arms, which hang to the ankles, have great crushing strength, and the heavy body is clothed in a reddish coat of long, shaggy hair.

Orang-utans, unless frightened, move about in a slow, stolid way by swinging from branch to branch, and live in solitary family parties, resting at night on beds of sticks, constructed among treetops not far from the ground, to which they rarely resort. They feed on leaves and palm-shoots, but mainly on fruit; and will hurl nuts and fruits at men or suspected animals that come beneath their favorite trees. Their chief enemies are pythons and crocodiles that may seize them when they go to rivers to drink. They fight much among themselves, by trying to bite off each other's fingers, but are not disposed to attack human beings, yet a possible encounter with one of them is greatly feared by the Dyaks, who know no other dangerous beasts. Babies are occasionally obtained and taken to Europe, and many orang-utans have lived many years in the zoological gardens of the United States and other countries. They are as friendly toward their keepers and as teachable as the more conspicuous and lively chimpanzees. See also ANTHROPOID APE; APE; CHIMPANZEE. E.I.

**ORATION**, a discourse before an assembled audience undertaken with the object of persuading or convincing. The art of oratory was highly esteemed among the ancients and was the object of systematic

and prolonged study. The old style has almost died out, modern orators avoiding the florid passages, classical allusions, dramatic tones and elaborate gestures that were formerly thought to be suitable embellishments to public speeches. But the framework on which the art of oratory is built remains to-day more or less unchanged. It has three main divisions: idea, arrangement and elocution. The first is concerned with the arguments to be used in seeking to prove and convince. The second is concerned with the order, classification and marshaling of the arguments. Among the ancients this order was as follows: introduction, proposition, narration, proof or confirmation (or refutation, as the case might be), and finally, peroration. The introduction prepared the audience to listen, the proposition indicated the subject of the oration, the narration, in use in legal orations, gave the facts of the case, the proof or confirmation established the truth enunciated in the proposition, the refutation was designed to destroy all objections to the orator's arguments, and the peroration completed the task of persuasion. In the main, this ordering of the orator's material is still in general use. The third division, elocution, relates to voice, delivery, diction, gesture and the whole manner of the discourse in its spoken aspect. While not concerned with either the idea or the arrangement of the arguments of the oration, elocution is of enormous importance in adding to the sense of pleasure that the listener derives from the oration.

**ORATORIANs**, members of the Congregation of the Oratory, a Roman Catholic religious society founded by St. Philip Neri in 1564, and taking its name from the oratory in which the first meetings were held. The Congregation is composed of groups of secular priests who live together in communities, but who are not bound by vows. They retain their own property and may leave at any time. Each house, or Oratory, is independent of the others; each is headed by a superior elected by the members. Besides the Oratory at Rome, other houses exist in Italy and in Spain. There are also houses in London and Birmingham, England, the Congregation having been introduced into England by Cardinal Newman in 1847. A French Oratory similar to that of St. Philip Neri, though forming a distinct institution, was founded in Paris in 1611 by Pierre de Berulle. It comprises 10 houses, or colleges, with a superior-general residing in Paris.

**ORATORIO**, the ecclesiastical counterpart of the OPERA and of identical origin, namely, the miracle plays of the Middle Ages, the oratorio may be defined as a sacred opera divested of scenery, action and costume. To San Filippo of Neri (1515-95), whose religious lectures at San Girolamo were called "Oratories," the verbal as well as the esthetic origin of the oratorio may be traced; for these lectures were accompanied by music specially composed for the occasion by Giovanni Animuccia (c. 1500-70) who preceded PALESTRINA as the papal maestro. Known as *Laudi Spirituali*, or sacred madrigals, Animuccia's vocal com-

positions placed at San Filippo's service the marriage of music and dramatic narrative, and it was not long before the value of this union was recognized by other composers throughout Europe.

In recognition of Animuccia's priority in this field, he is often called the "father of oratorio." The first true forerunner of the modern oratoria, however, was Emilio del Cavaliere's *La Rappresentazione di Anima e di Corpo*, produced in Rome in 1600, which was a sacred vocal work with choruses, solos, recitatives, and orchestral accompaniment. Although scenery and dancing enhanced the original performance, these visual adjuncts were shortly abandoned for that more austere presentation which now is common and which outwardly distinguishes the oratorio from the opera. Thenceforth the paths of both forms separated sharply.

For a full century there were no oratorios of genuine importance. With the birth of J. S. BACH in 1685, however, the form received a direct and lasting impetus in such creations as his *Passion According to St. Mark* and *Passion According to St. John*; and with the advent of FREDERICK HANDEL (1685-1759) the oratorio almost overnight reached maturity, finding in this composer, who originally was devoted to opera, a genius of unexampled eloquence in dramatic narrative. FRANZ HAYDN's oratorios *The Creation* and *The Seasons*, and FELIX MENDELSSOHN's *St. Paul* and *Elijah*, the latter a work of true magnificence, were later and first-rate contributions to this *genre*; but it may safely be said that no composer before Handel or since him has so completely recognized the limits and developed the potentialities of the oratorio. Of a full score of examples, at least half a dozen, *Esther*, *Saul*, *Israel in Egypt*, *Samson*, *Judas Maccabaeus*, and *Jephtha*, take high rank in this department of musical literature, while *The Messiah* stands supreme and unchallenged. First performed in 1741, its continued popularity to-day promises that it will endure throughout the ages.

**ORATORY** (Latin *oratorium*, prayer hall), a room for prayer provided with crucifix and altar; in cloisters, a hall for prayer. The Priests of the Oratory, a congregation founded by St. Philip Neri in 1558 and named after the hall where they held their devotions, accompanied their evening prayers with music, whence arose the name "oratorio" for a musical composition of a religious nature.

**ORATORY OF ST. PHILIP NERI, CONGREGATION OF THE**, popularly known as Oratorians, communities of secular priests living according to the precepts of St. Philip, who in 1575 founded the institute at Rome. Sta. Maria in Vallicella (now the Chiesa Nuova) is the mother church. Each community is independent and members take no special vows. Introduced into England by Cardinal Newman in 1847 and established in London in 1849, the Oratory opened its present home, Brompton Oratory in South Kensington, in 1884. At Edgbaston, near Birmingham, a permanent foundation was made in 1854. There are 25 houses of the Congregation in Italy, England, Spain, and Mexico, and about 150 members. The Brother-

hood of the Little Oratory is a confraternity working in collaboration with Oratory communities.

**ORBIT**, the path of one celestial body around another, such as that of the moon around the earth, of a planet or comet around the sun, or of one component of a BINARY STAR around the other. It is customary in CELESTIAL MECHANICS to take the larger and more massive of the two bodies as stationary in space, e.g., the sun in the solar system, and to ascribe all motion to the lesser object. Under these conditions Newton's law of gravitation requires the orbit to be a plane conic section, with the heavier body occupying one of the foci. Some of the comets and meteors swing about the sun in what are apparently parabolic or hyperbolic orbits, but with these exceptions, orbits are elliptical. Whatever influences are then still exerted by a third or fourth body are subsequently allowed for in the form of small corrections called PERTURBATIONS.

To describe the position, shape and size of an orbit completely it is necessary to find the values of seven different quantities: the line of intersection of the orbital plane with the plane of the ECLIPTIC, called the line of NODES; the angle between these two planes called the inclination; the length of the major axis of the ellipse; the angle which this line, often called the line of APSIDES, makes with the line of nodes; the eccentricity of the ellipse, and finally the period of revolution and the position occupied at a given instant. It is then possible to calculate the position of the object in its orbit for all times, past or future. Three observations of the position of a planet or comet in the sky, preferably at considerable intervals, suffice for a determination of the orbit around the sun. The orbit can be determined much more accurately if more observations are available.

W. J. L.

**ORCAGNA** or **ARCAGNUOLO** (c. 1308-68), real name Andrea Di Cione, Italian painter, sculptor and architect, the most important of three brothers of this name, was born in Florence about 1308. Orcagna worked with Giotto on the reliefs of the Campanile at Florence. (See also GIOTTO'S TOWER.) He was the first Florentine architect to replace the Romanesque semicircles with the Gothic oval, as in the Galleria dei Lanzi. His greatest sculptural work is the *Tabernacle of the Virgin* in the Church of Or San Michele, in which realistic marble reliefs are accented by a wealth of mosaic detail. Orcagna executed *The Triumph of Death* frescoes in the Campo Santo at Pisa and the magnificent *Paradise* fresco in the Strozzi Chapel of Santa Maria Novella, Florence. The figures of Christ and the Virgin in the latter are the most splendid in 14th century Florentine painting. There is a tempera altar-piece by Orcagna in the National Gallery, London, and one also in Santa Maria Novella. Orcagna died in Florence, probably in 1368.

**ORCHARD GRASS** (*Dactylis glomerata*), a well-known meadow and pasture plant called also cock's-foot grass. It is a native of Europe and Asia, widely cultivated in the moister parts of the United States and extensively naturalized in fields and roadsides.

The grass is a rather coarse, erect perennial, soon forming large tussocks, with stems 2 to 4 ft. high, broad flat leaves and numerous flowering spikes on short stiff branches.

**ORCHESTRA**, a collection of musical instruments possessed of great variety of tone-color, pitch, resonance, and physical constitution. The number of different instruments composing it, like the number of participating performers, naturally varies according both to the demands of the composer and to historical exigence. The orchestra needed for performing a Mozart symphony is consequently much more modest than one needed for performing a tone-poem by Richard Strauss, the former being composed of between 8 and 10 different instruments played by from 20 to 60 performers, and the latter being composed of between 20 and 25 different instruments played by from 80 to 120 performers. Indeed, the number of performers is so variable, if augmented festival orchestras are considered, that no statement respecting the total of the performers should be considered final. For example, during the World's Peace Jubilee at Boston, Mass., in 1872, there was assembled an orchestra whose performers numbered 1695, exclusive of 100 firemen beating anvils during the rendition of Verdi's *Anvil Chorus*. Hector Berlioz's ideal of a festival orchestra consisted of 300 performers, the instruments including 30 harps and 30 pianofortes. Permanent orchestral bodies of the present day, such as the Boston, Philadelphia, and New York Philharmonic Symphony orchestras, content themselves with between 100 and 115 members, and this number of players may be taken as the standard of the present day.

Necessarily the number of instruments varies. Taking a Wagnerian score as a modern standard, there are four main groups of instruments, namely, wood-wind, brass, strings and percussion. Under these heads the various instruments are grouped as follows:

<i>Wood-wind</i>	<i>Strings</i>
Piccolo	Violin
Flute	Viola
Oboe	Violoncello
Cor anglais	Double-bass
Clarinet	Harp
Bassoon	
<i>Brass</i>	<i>Percussion</i>
Horn	Kettledrum
Trumpet	Bass drum
Coronet-à-pistons	Cymbals
Trombone	Triangle
Tuba	Bells
	Xylophone
	Glockenspiel

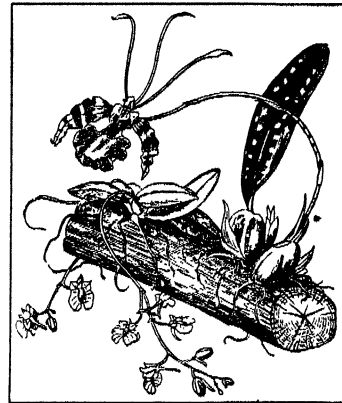
Although a modern score will occasionally supplement this array with two or three relatively unimportant instruments, the foregoing may be taken as the material composing the modern orchestra in all but exceptional cases.

A partial list of celebrated orchestra conductors includes Luigi Mancinelli (1848- ) and Arturo Toscanini (1867- ) of Italy; HANS GUIDO RICHTER (1843-

1916), ARTHUR NIKISCH (1855-1922), Karl Muck (1859- ) and Felix Weingartner (1863- ) of Germany, or belonging to the German school; Leopold Stokowski (1880- ) of Poland; Charles Lamoureux (1834-99) of France; SIR THOMAS BEECHAM (1879- ) and Albert Coates (1882- ) of England; and THEODORE THOMAS (1835-1905), WALTER DAMROSCH (1862- ), FREDERICK STOCK (1872- ) and HENRY HADLEY (1874- ) of the United States.

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**ORCHIDS**, an immense family of plants noted for the beauty of their flowers and found throughout the world except the polar regions. Over 6,000 species are known, the vast majority of them living in the tropics. Their diversity of form is so great that it is difficult to characterize the group as a whole. All orchids are herbs, mostly perennial, and while nearly all the tropical species are EPIPHYTES, those of tem-



EPIPHYTIC ORCHIDS

perate regions grow in the ground. None are autophytic, most orchids getting their food by the aid of mycorrhizas. A few, like the putty-root or coral-root are partially or wholly parasitic, and a few tropical forms are SAPROPHYTES (*Galeola*).

The flowers of orchids are the most complex floral organs known. Because of their beauty double the number of wild species have been evolved by breeders, so that well over 15,000 named species and varieties are known. The flower consists always of very irregular and much modified perianth segments, which makes the flower highly specialized and often grotesque. The stamens and pistil are united to form a column, the resulting structure often consisting of a single fertile anther grown to the style. Most of the showy kinds seen in cultivation, have, besides the petals, an irregular, and often bearded lip. The irregularity of their flowers is reflected in such common names for them as lady's slipper, shell orchid, butterfly orchid, swan orchid, windmill orchid and hundreds of others. Some of the rarer kinds have commanded high prices.

It is among the tropical epiphytic orchids that the greatest development of color and form has been developed. Some genera, such as *Epidendrum* and *Dendrobium*, contain over 600 species. All the epiphytes develop a curious modification of their roots, which condense and absorb atmospheric moisture. Among the epiphytes, also, is the only orchid of economic importance, the *VANILLA*. N. T.

**ORCHID-TREE**, a common name for a large genus (*Bauhinia*) of tropical trees, shrubs and woody vines belonging to the senna tribe of the pea family. There are about 150 species, several of which, as the St.-Thomas-tree (*B. tomentosa*), are planted as ornamentals in the southern parts of Florida and California. Various species are also called mountain-bony.

**ORCZY, BARONESS EMMA MAGDALENA** (Mrs. Montague Barstow) (1865- ), Hungarian playwright and novelist, was born at Tarnaörs, Hungary, in 1865. She was educated in Brussels and Paris. She began her literary career in 1900. Her dramatized novels include *The Scarlet Pimpernel*, written in collaboration with her husband, *The Sin of William Jackson*, *Beau Brocade* and *The Legion of Honour*. Among her other novels are *A Son of the People*, *The Emperor's Candlesticks*, *By the Gods Beloved*, *Unto Caesar*, *Castles in the Air*, *The Honourable Jim* and *Marivosa*.

**ORDEAL, TRIAL BY**, was practiced by most early cultures. Its purpose was to invoke divine judgment in matters not determinable by mundane judges. It is found in the Old Testament; Roman history furnishes examples; primitive peoples still practice it. In medieval Europe it became the prevailing method of determining guilt or innocence. The ordeal was preceded by elaborate religious ritual, the accused partaking of the Holy Eucharist. The oldest European form of ordeal was by hot water. The accused was required to pick a small object out of a kettle of boiling water, or simply thrust in his hand. The member was then wrapped in cloth. After three days it was examined; if healing properly the accused was adjudged innocent.

The ordeal by fire varied in character. Sometimes the accused was required to carry a red-hot iron of specified weight a certain distance, usually nine feet. In another form he was required to walk barefoot over hot plowshares, either blindfolded or compelled to touch each one with his naked foot. In the trial of ecclesiastics direct exposure to fire was common. Here the accused had to walk between two bonfires of determined size set a certain distance apart. In the cold water ordeal the defendant was found and thrown into the water. If he floated he was adjudged guilty on the theory that pure water would reject the guilty; if he sank he was innocent. Trial by battle was confined to Europe, being popularized by the customs of chivalry and the practice of challenging witnesses. Women and the physically feeble might be represented by a champion. The revival of Roman law in the 12th century tended to lessen the

use of the ordeal. The Fourth Lateran Council in 1215 forbade ecclesiastical ceremonies at ordeals, and after 1300 trial by ordeal became rare. W. I. B.

**ORDEAL OF RICHARD FEVEREL, THE**, perhaps the finest of the novels of GEORGE MEREDITH; it was published 1859. Richard Feverel is raised in scrupulous accord with a system which his philosophical father has devised to meet every emergency, moral or spiritual, that life can provide. This all-embracing system collapses at the most crucial stage in Richard's life, bringing down tragedy upon himself and Lucy, the girl with whom he is in love. The most interesting minor personages are the chivalrous Austin Wentworth, the cynical Adrian, the immoral, fascinating Mrs. Mount, and the comic rooming-house keeper, Mrs. Berry.

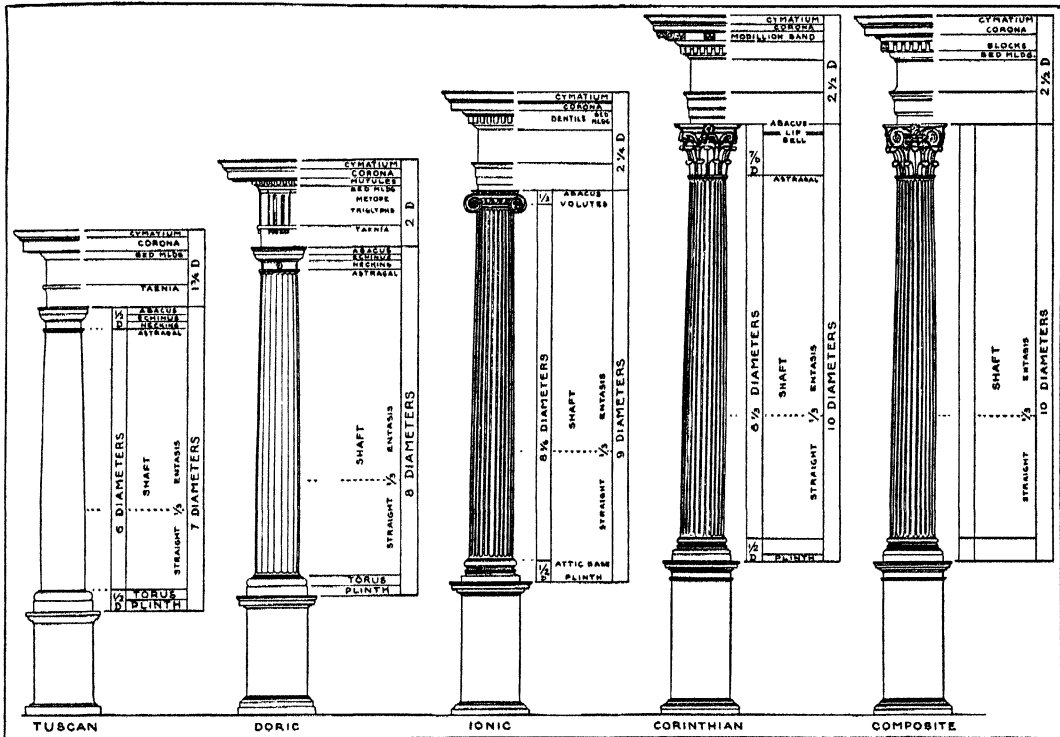
**ORDER**, in taxonomy, a subdivision of a class and made up of families. Examples of orders in botany among the flowering plants are Graminales, including the *Gramineæ* (grasses) and *Cyperaceæ* (sedges); Liliales, including the *Juncaceæ* (rushes), *Liliaceæ* (lilies), *Amaryllidaceæ* (amaryllises), *Iridaceæ* (irises) and other families; Rosales, including the *Rosaceæ* (roses), *Leguminosæ* (legumes) and several other families; the Polemoniales, including the *Polemoniaceæ* (polemoniums), *Convolvulaceæ* (morning-glories), *Verbenaceæ* (verbenas), *Labiata* (mints), and several other families. Examples of orders in zoology among the mammals are Carnivora, including the *Felidæ* (cats), *Canidæ* (dogs), *Ursidæ* (bears), and other families; Rodentia, including the *Sciuridæ* (squirrels), *Hystriidæ* (the Old World porcupines), *Leporidæ* (hares and rabbits), and several other families of gnawing animals. A. S. H.

**ORDER.** (1) In classic architecture, the combination of a column or pilaster, complete with capital and base, with the entablature or structure borne by the column, consisting of an architrave or beam member, a frieze, and an overhanging cornice. Sometimes a pedestal for the column, an arch impost, and an attic above the cornice are also included in the term. The orders are standardized systems developed in Roman and Renaissance times, according to which correct proportions might be determined for five classes of order: Tuscan, Doric, Ionic, Corinthian and Composite. (2) In medieval architecture, one of the series of arches, or breaks in the wall beneath them, in an opening through a wall graduated progressively from the smaller in diameter on the inside face of the wall to the largest on the outside. Thus, a Romanesque doorway is often said to consist of two, three or four orders, as the case may be, depending upon the number of steps in the plan and section between the comparatively small door and the large outer opening.

The orders were originated by the Greeks, who had used three general classes of columns, Doric, Ionic and Corinthian, by the 4th century B.C. The first known attempt at systematization, however, and expression of the orders in terms of definite proportion, was Roman and was made by Marcus Pollio Vitruvius, in

the Augustan Age. What he was evidently attempting was less a rule to follow than a generalization from observed facts; but the later Renaissance architects, in their enthusiasm for his writing and their desire to emulate him, attempted more rigorous rules. The first complete Renaissance codification is due to G. Barozzi da Vignola, published in 1563 and followed seven years later by the system of Andrea Palladio. Both of these were much translated and imitated throughout Renaissance Europe and formed the basis for all later classifications. It is noteworthy, however, that in their own architectural work, both

supported by an ovolo with a fillet below. Beneath this is a short section of the shaft, called the necking, separated from the rest of the shaft by an astragal. The entablature is one-quarter the height of the column, a proportion that is standard in all the orders, and consists of a plain architrave with a projecting fillet at the top called a taenia, a plain frieze, and a crowning cornice with a bed-mold of a single molding, an undecorated projecting corona, and a cymatium or crown mold of ovolo section. The Tuscan order is solely a creation of the Renaissance codifiers, derived upon misunderstood interpretations of Vitruvius's de-



FROM W. R. WARE, AMERICAN VIGNOLA. INTERNATIONAL TEXTBOOK CO., SCRANTON, PA.

THE FIVE ORDERS OF ARCHITECTURE

Vignola and Palladio rarely followed their own rules, always suiting the details of an order to its general scale and position. The orders, as established by Vignola, were five in number, adding a Tuscan, or simplified Doric, and a Composite, a variant of the Corinthian, to the original group of three. These codifications describe only the most common Roman forms; Greek types are frequently radically different. In the following descriptions of the orders the simplest systematization of the Renaissance will be given with the most important variants.

**Tuscan Order.** In this, the simplest of the orders, the column is seven diameters high, with the capital and base each occupying one-half a diameter. The base has a square plinth supporting a single large torus. The capital is formed of a plain square abacus

supported by an ovolo with a fillet below. Beneath this is a short section of the shaft, called the necking, separated from the rest of the shaft by an astragal. The entablature is one-quarter the height of the column, a proportion that is standard in all the orders, and consists of a plain architrave with a projecting fillet at the top called a taenia, a plain frieze, and a crowning cornice with a bed-mold of a single molding, an undecorated projecting corona, and a cymatium or crown mold of ovolo section. The Tuscan order is solely a creation of the Renaissance codifiers, derived upon misunderstood interpretations of Vitruvius's de-

scriptions of Etruscan temples; it is in essence a simplified Doric.

**Doric Order.** The column is eight diameters high, with capital and base each one-half diameter and the shaft between fluted. The base differs from that of the Tuscan in having a smaller torus added above the large one; and the capital, by adding a small crown mold to the abacus and a secondary small astragal under the ovolo or echinus. Occasionally rosettes are added to decorate the necking. The main feature of the entablature is the series of triglyphs in the frieze, separated by square slabs called metopes. The triglyphs are vertical blocks about twice as high as their width, decorated by vertical grooves. Beneath each triglyph, a small subsidiary block, called the regula, is attached to the bottom of the taenia.



The underside of the regula carries six guttae, or drops. Above each triglyph, on the underside of the corona, is another flat projecting slab known as a mutule, carrying 36 guttae in six rows of six each. Two types of bed-mold are found, one the denticulated, in which a row of dentils separates frieze and cornice, and one in which there is a simple square band. The cymatium is also of two types, one with the cavetto and one with the cyma recta.

The Doric order is the earliest of the orders and was well developed by the 6th century B.C. In its Greek form, the column has no base, and its relative height, taper or entasis, and the proportions of the capital vary enormously. In general, the earlier examples are squat, with exaggerated entasis, and very widely projecting capitals. The Greek Doric capital has an abacus unmolded, and the ovolo is usually of very flattened elliptical or hyperbolic section, becoming almost conical in the later examples. Similar variations in the proportional height of the entablature exist, early examples being extremely heavy, up to nearly one-half the height of the column, and later examples being as light as one-fifth. The column, with its capital, is evidently a masonry interpretation of the common Aegean wooden column like those of the Palace at Knossos, about 1500 B.C. The entablature is an interpretation in stone of primitive wooden construction, probably developed by the Hellenic Greeks. Thus the plain architrave represents the main wooden beams spanning from column to column and covered by a projecting cover board, the taenia. The triglyphs represent the ends of wooden crossbeams, decorated with vertical cuts, and pinned in place by pegs through the taenia represented by the guttae. Similarly, the mutules are the underside of sloping roof beams protected by wooden boards pegged in place, the pegs again being represented by guttae. The metopes represent boards or slabs set between the crossbeams to shut out the weather. In the Greek Doric cornice there is always a mutule above each metope as well as above each triglyph. The Greek search for perfection led to continual experiment in detail forms and relations. The most perfect example is usually considered to be the Parthenon at Athens.

The Roman Doric order resulted from a combination of Greek ideas with those of early Etruscan buildings. Various transitional examples are found, such as that of the Temple of Hercules at Cori, or the Tabularium at Rome, both of the time of Sulla. In later examples of specifically Roman type, with complete base, an elaborate necking is found; and in some a cyma recta, richly carved with acanthus leaves, takes the place of the ovolo in the echinus.

**Ionic Order.** The column is nine diameters high, with base and capital. The base is usually of the so-called Attic type, with two toruses separated by a scotia and supported on a plinth. The capital is the most characteristic part of the order, with its large volutes or spiral scrolls, connected by more or less horizontal bands, sometimes curved slightly down in the center under the abacus. These scrolls roll

down at each end of the capital; between them and under the band connecting them is an ovolo echinus, usually carved with the egg and dart, and with a bead molding below. Under this is a necking and astragal as in the Doric order. In the little triangles, where the curve of the spiral meets the echinus, there are usually small anthemion forms. The ends of the capital have a molded bolster connecting the volutes of the back and front faces; the capital is accordingly not the same on all four sides. Where an Ionic capital occurs on a corner, it is therefore necessary to use a special type, obtained by placing the volutes on two adjacent sides and sweeping out the corner volutes until they meet at a pleasant angle. The corner capital is always awkward on its interior faces, and this led to the development of a four-sided Ionic order, in which all the volutes are thus treated. Although this form was used in later Greek work, it was codified only in the later Renaissance and became a favorite Baroque form under the name of the Scamozzi Ionic. The Ionic architrave consists of three bands, each larger than the one below it, and is crowned by a molded taenia. The frieze is plain. The cornice bed-mold consists of a cyma reversa below, a dentil course in the middle, and an ovolo above. The cornice has a plain corona and a cyma recta cymatium.

The origin of the Ionic order is to be found in Asia Minor and resulted from the merging of Greek creativeness with various Assyrian and Phoenician forms, based upon the Egyptian trilobe lotus. This form, with exaggerated spiral side lobes, had been used as a stele cap; the Greeks enlarged it somewhat to serve, first as a support for votive offerings, and later as a column capital. The most primitive type, with enormous spirals and a very awkward junction between them and the column, is seen in an example from Neandreaia. The echinus was developed in the effort to soften the junction; at the same time the size of the volute was tremendously decreased. Many transitional examples were found in excavations on the Athenian Acropolis. The finally perfected type is best seen in the two slightly differing orders from the two porches of the Erechtheum in Athens. Roman examples are largely variations of the Greek type, usually less refined in detail, with a heavier abacus and smaller volutes.

**Corinthian Order.** The column is 10 diameters high. The base, a half diameter high, is similar to the Attic base, with the addition of a small torus flanked by fillets in the center of the large scotia. The capital, usually seven-eighths of a diameter high, is the most characteristic portion. It consists of a central core, shaped like an inverted bell, and surrounded with acanthus leaves and scrolls. At the top is an abacus with concave sides and cut-off diagonal corners. Its edge is molded with an ovolo above and a cavetto above, separated by a fillet. Between the capital and the shaft is an astragal. The acanthus leaves are arranged in two rows, with eight leaves each; the upper row has the leaves on the faces of the

column, that is, with one exactly on the front as the column is set in the building, one exactly in the back, and so on. These upper leaves are spaced above the spaces between the lower leaves, so that in some examples the upper leaf mid-rib can be seen for its entire height between the lower leaves. Between adjacent leaves of the upper row grow up partially geometrical and partially foliated forms known as caulicoli, from which spring the spiral volutes, two from each, one large and one small. The larger volutes from adjacent caulicoli meet under the corners of the abacus which they serve to support; the smaller meet on the centers of the capital and support a large rosette that covers the greater part of the height of the abacus. The entablature has a three-banded architrave and a plain frieze, like the Ionic; its distinguishing feature is the band of modillions, or little scrolled brackets, which crown the bed-mold and support the overhanging corona. The cymatium consists of a cyma recta, usually with a small cavetto or small cyma reversa beneath it. Two types of capitals are commonly found, one in which the heights of the two rows of leaves are even and the ends curl over and project strongly, and another in which the tops of the upper row are much closer to the tops of the lower row, so that the outcurl of the leaf ends produces an almost continuous wreathlike effect. Endless differences in detail characterize the capital and entablature.

The Corinthian capital was first developed in Greece, probably in the late 5th or early 4th centuries B.C. According to the charming legend found in Vitruvius, it was invented by a Corinthian sculptor and brass worker because of his delight in the effect produced by an acanthus plant growing up around a basket of offerings capped with a square tile and left on a grave. It is possible that Greek travelers' memories of the campaniform capitals of Egypt may have influenced the form. Some Greek examples lack the scrolls entirely, consisting of a bell carved with delicate pointed leaves close together and surrounded at the bottom with a row of richly projecting acanthus leaves, as in the so-called Tower of the Winds at Athens, 1st century B.C. An example from the Tholos at Epidauros, middle of the 4th century B.C., shows approximately the fully developed form. The choragic monument of Lysicrates at Athens, 335 B.C., has a capital of extraordinary richness, with, however, an unfortunate lack of unity. The Greeks evidently were still experimenting with the capital and never developed a special type of entablature for it.

Roman tradition laid the origin of the Roman Corinthian order to a capital from the Temple of Zeus at Athens, which Sulla brought to Rome. The existing capitals of this Athenian temple are all of Roman date, from the rebuilding under Hadrian. In any case, the Etruscans had used capitals with many Corinthian characteristics long before the time of Sulla; and, whatever the source from which the Romans gained their knowledge of Corinthian types (possibly Campania?), it was soon developed by them into its typically Roman shapes and became the order

which the Romans most loved. It was the Romans who developed the special entablature and invented the modillion; they found in its combined strength and richness a fertile field for experiment and modification, and achieved results with it which have never been equaled, such as the exquisite order of the Temple of Castor and Pollux in Rome or that of the Roman Temple of Concord, in which rampant animals take the place of the corner volutes.

**Composite Order.** In the search for variations of the Corinthian capital the Romans hit upon the idea of combining its two rows of acanthus leaves with an upper portion like a four-sided Ionic capital. This was the Composite capital and is found as early as 71 A.D., for a beautiful example was used in a garden pavilion in Pompeii. The most famous early example is that on the triumphal arch of Titus in Rome, 81 A.D., and the most lavish is one from the baths of Caracalla in Rome, 211-216, decorated with powerful figures of Hercules. The Romans, however, never developed a separate entablature for the Composite capital, and the complete Composite order is purely a Renaissance outgrowth.

The Composite order of the Renaissance codifiers, like the Corinthian, has a column 10 diameters high. The base is also like that of the Corinthian order except that the small torus in the center of the scotia is doubled. In the entablature, the main difference occurs in the bed-mold of the cornice, where uncarved square blocks of great relative depth, like enlarged dentils, take the place of the Corinthian modillions. This form was partly based on the entablature of the great Temple of Venus and Rome, at Rome, built by Hadrian, and is but one of many variations of the normal Corinthian entablature. The use of such square blocks possibly goes back to the great enlargement of the dentil course found in many Hellenistic Ionic temples of the Asia Minor cities.

**Renaissance and Modern Orders.** The Renaissance architects seldom copied Roman examples line for line, being always too much the creators to unswervingly accept tradition. Even Vignola (1507-72), codifier as he was, revealed in his own work a most sensitive feeling for refinement and modification in order design. In all the early Renaissance styles this freedom was even more marked; and 15th century Italian examples, like those of the Francis I style in France, are usually Corinthianesque rather than pure Corinthian, and are often based on certain Roman pilaster capitals in which S. scrolls take the place of the caulicolus and its volutes. Renaissance architects made infinite variations of this theme, often using birds or cherubs or cupids' heads in place of the Roman foliated ornament, and endlessly modifying the acanthus. Similarly, the Baroque architects, in their search for dramatic grandeur and lavish line, changed and modified the order forms at will. A characteristic Baroque development is that of the twisted column, like that of the baldachino, 1633, of St. Peter's in Rome by Bernini, said to have been based on a late Roman column found in Jerusalem.

The classic revivals of the early 19th century popularized the use of the orders to such an extent that for nearly a century they have been in all the countries of the western world a chief source of decorative effect, especially in monumental and governmental buildings. A rising volume of protest against this often unthinking and sometimes parrotlike use of the orders has characterized the present century; especially the growing importance to-day of the functionalist attitude towards architecture has made many designers look askance at any decorative use of the orders such as that made by the Romans. The tradition of the order forms is, however, so strong that it continues to crop out occasionally whenever columns are necessary. This is especially true of Scandinavian work, as in Ivar Tengbom's Concert Hall at Stockholm.

T. F. H.

**BIBLIOGRAPHY.**—See the various reprints and modifications of Vignola's book; and, for a simple presentation of accepted standards, Wm. R. Ware, *The American Vignola*, 1910.

**ORDER OF THE GARTER**, a British high order of chivalry and one of the oldest European orders of knighthood. Its origin dates back to the 12th century during the reign of Edward III and has been fixed as between the years 1346 and 1348. The exact occasion for the order is not known. Regular membership has always been limited to 25 knights companions and the British sovereign who heads the order. Royal princes and foreign sovereigns may be admitted as supernumerary members. A prelate who has always been the head of the see of Winchester, a chancellor or the bishop of Oxford; a registrar; the dean of Windsor; a herald and a Garter king-at-arms are among the officers.

This order was originally the Order of Saint George which accounts for the badge of membership bearing the figure of the saint fighting the dragon. The emblem is a garter of dark blue ribbon edged with gold bearing the motto, *honi soit qui mal y pense*, i.e., "shame to him who thinks evil."

**ORDERS, MILITARY.** A military order is an authoritative instruction emanating from a superior and requiring compliance or obedience by subordinates. In substance an order is less general and more specific than is a regulation. Various terms, more or less descriptive, are in use in the U.S. Army to distinguish orders with reference to manner of communication, scope, and purpose. An oral or verbal order is an instruction or direction given by word of mouth, by the commander himself, directly or through an agent, to those charged with its execution. Some informal note of the substance of such an order is made by the superior who issues and the subordinate who receives it, if circumstances permit and the nature and importance of the order justify the notation. Dictated orders are orders communicated orally by the commander and reduced to writing on the spot by those addressed.

General orders are issued by the War Department, by the commanders of the larger military units, beginning with battalions and squadrons not organized

into regiments and by the commanders of posts, camps, stations, districts, departments and corps areas. Such orders include "matter of importance, directive in nature, general in application, and of permanent duration, not readily susceptible of immediate incorporation in established forms of regulations." Special orders may emanate from the same sources as do general orders. A special order is one that includes matter concerning individuals but is not of general and wide-spread interest.

Field orders are formal orders given by a commander setting forth the situation, the tactical mission and the plan of action decided upon, with such details as to method of execution as will insure coordinated action by the whole command. They are designed to bring about a course of action in accordance with the intention of the leader, suited to the situation and to insure cooperation between all branches and services. Under stress of active operations field orders and combat orders must often be issued in fragmentary form, in dispatches and notes which do not meet all formal requirements respecting orders but do bear such a relation to prior orders or instructions as to convey the commander's wishes to those to whom they are addressed.

Administrative orders deal with matters of administration and supply not covered in field orders, and thus include information and directions concerning the supply of subsistence, ordnance, medical, quartermaster and other military stores; the evacuation of the sick and wounded; the disposition of stragglers and prisoners of war; and the control of traffic and the means of transportation.

E. A. K.

**BIBLIOGRAPHY.**—U.S. Army *Regulations*; U.S. Army *Field Service Regulations*; U.S. Army *Combat Orders*, Command and General Staff School.

**ORDERS, SACRED** or **HOLY**, pertain, in the Catholic Church, to the clergy who have received through ordination the supernatural grace to administer the priestly office. As Holy Orders impart an indelible character, they can never be lost and only once received. They are properly only one sacrament in seven different degrees; but in ecclesiastical parlance each grade is designated an order. The first four, called minor orders, are usually conferred together, preceded by the tonsure; they have to do with the care of the church, the liturgy, reading the Scriptures, exorcising, and serving at Mass. They have not yet a true sacramental character, so that those in minor orders are not yet obligated to the breviary and celibacy. The three higher or major orders enable the subdeacon and deacon to assist directly at the Mass, and the latter to distribute the Sacrament; and to preach and to catechize. The deaconate signifies the first step in the priesthood in a wider sense, and the episcopate, with its power of ordination, represents the completion of the priesthood and with the possession of the teaching, ordaining and governing powers, the highest step.

**ORDERS IN COUNCIL**, decrees or ordinances issued by British ministers representing the Privy

Council, in the name of the Crown. They are considered to be within the King's "prerogative," but may not alter any provision of an act of Parliament. They may also, and generally are, issued by administrative departments on authority expressly given by statute. Their use was very frequent during the World War. The most celebrated historical instance is that of the Orders in Council of 1807, when Great Britain was at war with France. These orders were especially felt in the United States as they closed to American commerce and ships countries embraced in the Napoleonic system.

**ORDINAL NUMBER**, a number which tells the position of some element in a series, such as first, second, third, . . . Compare **CARDINAL NUMBER**. See **NUMBERS**, **THEORY OF**.

**ORDINANCE**. See **LEGISLATION**.

**ORDINANCE OF 1784**, an act of the Congress of the Confederation, the first action for the government of the western territory. In Mar. 1784, THOMAS JEFFERSON presented to Congress a bill including directions for the establishment of temporary government by a meeting of settlers "either on their own petition, or on the order of Congress," and of a permanent constitution and government when any state had 20,000 inhabitants; and admittance into the Union when a state had as many inhabitants as was at the time contained in "the least numerous of the original 13 states." One provision assigning names to the potential states, and another prohibiting slavery in the West after 1800, were stricken from the ordinance as passed Apr. 23, 1784. The statute was superseded by the **ORDINANCE OF 1787**.

**ORDINANCE OF 1785**, an act of the Congress of the Confederation providing for the disposal of the public domain, which provided the basis of the public lands policy of the United States. The ordinance, devised by a committee of 13, debated in Congress April-May, passed May 20, provided for the appointment of a geographer, and for a surveyor from each state; the plotting of six-square-mile townships in tiers; the subdivision of the townships into lots of 640 acres, the unit of sale; public sales, at a minimum price of one dollar per acre; and, among other reservations, for the reserving of lot number 16 in every township for the maintenance of public schools within the township. The latter provision was the foundation of the broad policy of free, popular education in the West.

**ORDINANCE OF 1787**, an act of the Congress of the Confederation for the government of the western territory, stating the fundamental principles of governmental procedure and of civil liberties followed by the United States in the erection of states from the public domain. The act, as passed July 13, 1787, included a series of fundamental declarations of personal and political rights, such as liberal descent and conveyance of estates, freedom of religion, the right of habeas corpus and of trial by jury, prohibition of excessive bail, immoderate fines and cruel and unusual punishments and protection of bona-fide con-

tracts. The act also included a scheme for immediate government of the territory, and for the expansion of the temporary government; and provisions for the ultimate status of the territory. For immediate purposes, it was provided, there should be but one government for the district northwest of the Ohio, from which ultimately three to five states were to be created, their boundaries designated, statehood and permanent incorporation into the Union to be contingent on a population of 60,000. The immediate government was to be constituted of five officials appointed by Congress, with practically arbitrary powers. As soon as the population of a district reached 5,000 free male inhabitants, a general assembly with power to legislate might be established. Highly important were the exclusion of slavery from the territory and the provision that schools and the means of education should forever be encouraged. The ordinance became the broad precedent of the public lands policy of the United States.

**ORDINATE**, in analytic geometry the distance  $BP$  (or  $OA$ ) of a point  $P$  from the axis of abscissas,  $OX$ , measured along a line parallel to the axis of ordinates,  $OY$ . See **COORDINATES**; **ANALYTIC GEOMETRY**; **AXIS**.

**ORDNANCE**. An English ordinance once prescribed the standard sizes of arms to be used in the royal forces. Thereafter arms complying with the standards were called ordinance arms, later simply ordnance. The term still obtains for all combat material in a strictly military sense, but in a general sense refers more particularly to artillery.

Artillery ordnance comprises divisional artillery, the 75-mm. gun and 105-mm. howitzer; corps artillery, the 105-mm. gun and 155-mm. howitzer; army artillery, the 155-mm. gun and 240-mm. howitzer; the heavy reserve mobile artillery from the 250-mm. guns to 420-mm. gun or howitzer mounted on railway cars for special carriages; the antiaircraft artillery, 77-mm. to 105-mm. guns; and the seacoast defense artillery on fixed mounts in the harbor fortifications, ranging in caliber from 55-mm. to 420-mm. in type to guns, howitzers and mortars.

The fixed carriages are constructed as pedestal mounts, barbette mounts, disappearing mounts, turret mounts and mortar mounts. Mobile ordnance is carried on wheeled mounts, self-propelled or tractor mounts and railway mounts. The mobile ordnance is sometimes brought into fortifications or to other seacoast points to supplement the fixed ordnance.

The heaviest guns (see **GUN**) on fixed mounts (see **GUN MOUNTS**) have ranges in excess of 25 miles considerably beyond the horizon at sea. The observation of targets and the fall of shots around them must be made by airplane. All other ordnance is provided with special **FIRE CONTROL** devices to observe and correct its firing.

The antiaircraft ordnance, firing at targets moving in three dimensions at high speeds, requires the use of complicated fire control devices, known as directors, height finders, data transmitters and receivers.

All types of ordnance are arranged to fire (*see* RANGING) by one of the following methods or cases. Case I: when the aiming is done entirely by one operator observing the target through a sight; Case II: when the direction is controlled by one operator observing the target through a sight and the elevation is set by a quadrant or clinometer. Case III: when all sights are omitted and both elevation and direction are set on angle measuring instruments. Long range fixed ordnance and antiaircraft ordnance use Case III fire. Mobile ordnance with field armies uses Case II fire, when a target is visible. Lighter short range ordnance uses Case I fire.

Naval ordnance includes bombs, torpedoes, mines, depth charges and the like. *See also* ARTILLERY, NAVAL. C. G. M.

BIBLIOGRAPHY.—W. H. Tschappat, *Text Book of Ordnance and Gunnery*.

**ORDNANCE DEPARTMENT**, a division of the U. S. DEPARTMENT OF WAR, corresponding to the Bureau of Ordnance in the Navy Department, in charge of all munitions of war for use in fortifications, the armies of the field and the militia of the Union. Upon the Chief of Ordnance rest the duties of designing, procuring, storing and maintaining such munitions and war supplies of the United States army, and of performing the technical engineering work requisite to investigate and construct experimental ordnance material. Detailed regulations for the manufacture, inspection and storing of this material and for the maintaining of reserve supplies, emanate from the Ordnance Department. S. C. W.

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**ORDOVICIAN PERIOD**, the second period in the PALEOZOIC ERA of geological history, marked by the continuing dominance of the trilobites of the preceding Cambrian period, and the rising importance of cephalopods.

**ORE**, that part of a geologic body from which it is commercially advantageous to extract the metal content. It may consist of one mineral or more, or the ore minerals may be scattered through rock. Worthless minerals usually found with ore are called gangue. The body as a whole is known as an ORE DEPOSIT.

The various metals are obtained from a fairly small number of minerals, or ores, some of the more important ones being as follows:

ALUMINIUM is obtained from BAUXITE and CRYOLITE; ANTIMONY is extracted from STIBNITE and TETRAHEDRITE; ARSENIC is yielded by ARSENOPYRITE; CHROMIUM comes from CHROMITE; COBALT is found in ARSENOPYRITE and SMALTITE; important COPPER ores are AZURITE, BORNITE, CHALCOCITE, CHALCOPYRITE, CUPRITE, MALACHITE, the native metal and TETRAHEDRITE; GOLD is extracted from ARSENOPYRITE, ELECTRUM, the native metal and the TELLURIDES; IRON comes from such ores as HEMATITE, LIMONITE, MAGNETITE and sometimes PYRITE and SIDERITE; LEAD is yielded by ANGLESITE, CERUSSITE, GALENA and a little from VANADINITE; MANGANESE is extracted from PYROLUSITE, RHODOCHROSITE and RHODONITE; MERCURY is

found in CINNABAR; MOLYBDENUM comes from MOLYBDENITE and WULFENITE; NICKEL ores are GARNIERITE, NICCOLITE and PENTLANDITE; PLATINUM is found principally as the native metal; POTASSIUM comes from ALUNITE; RADIUM is derived from PITCHBLEND and URANINITE; SILVER is obtained from ARGENTITE, CERARGYRITE, ELECTRUM, the native metal and TETRAHEDRITE; the rare elements of the THORIUM-CERIUM group come from MONAZITE; STRONTIUM is obtained from CELESTITE and STRONTIANITE; TANTALUM is extracted from TANTALITE; the ores of TIN are CASSITERITE and STANNITE; TUNGSTEN is yielded by SCHEELITE and WOLFRAMITE; URANIUM ores are CARNOTITE, PITCHBLEND and URANINITE; VANADIUM is extracted from CARNOTITE and VANADINITE; the ZINC ores are FRANKLINITE, SMITHSONITE, SPHALERITE and ZINCITE. *See also* METAL MINING. S. F. K.

**ÖREBRO**, a city of Sweden, capital of the district of the same name, situated near the western end of Lake Hjälmaren, about 130 mi. west of Stockholm. The 13th century castle has been used for important meetings of the Swedish Diet. The Church of St. Nicholas is another landmark dating from the 13th century. It was at Örebro in 1529 that the Diet voted the establishment of the Reformation in Sweden. Industrially Örebro is of considerable importance, leading the shoe industry in Sweden and manufacturing matches, snuff, chemicals and ironware. Pop. 1931, 37,523.

**ORE DEPOSITS**, natural mineral bodies from which are obtained the metals so necessary to mankind for the maintenance of present-day civilization. They are natural concentrations of minerals which it is advantageous to mine in order to extract the metals therefrom. Non-metallic mineral bodies, such as salt and coal, as well as ores are included in the more comprehensive term, MINERAL DEPOSITS.

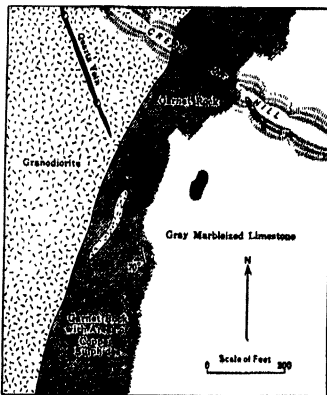
The definition of ORE manifestly involves economic considerations as well as geological ones, since the profit to be derived from working a given mineral body determines whether it is to be called ore or non-ore. The same mineral may be ore during times of high prices, and sub-ore during depressions. Also, improved technique of recovery may bring previously wasted material into the category of ore, or the demand created by new uses for an unusual metal may transform a geologically interesting mineral occurrence into commercial ore.

The metals "won" by mining constitute such an infinitesimal proportion of the earth's crust as a whole, that it is only because of pronounced local, natural concentrations that they can be profitably extracted. A study of the causes of these concentrations probably gives the best picture of the occurrences and genesis of ore deposits.

Surface processes of WEATHERING and SEDIMENTATION may produce local concentration of minable material, but the source of all metals is within the hot interior of the earth, in the ASTHENOSPHERE, where the IGNEOUS ROCKS have their birth. Occasional igneous intrusions from this zone into the overlying

formations entrain with them some metallic minerals. If no escape is provided, the hot solutions, or "melts," of metallic minerals cool with the igneous rock, segregating into separate masses as solidification proceeds, but remaining a part of the rock, intergrown with the rock-forming minerals. These deposits are known as magmatic segregations. Thus PERIDOTITES sometimes contain DIAMOND, CHROMITE or platinum, while in such BASIC ROCKS as GABBROS may be found CHALCOPYRITE, PENTLANDITE, PYRRHOTITE and PYRITE. MAGNETITE is known to occur in some SYENITES, and CASSITERITE in GRANITES. CHROMIUM, PLATINUM, COPPER, NICKEL and TIN are metals yielded by this type of deposit, of which the copper-nickel ores in norite, mined in Ontario are a typical example.

If the rocks in contact with the metal-bearing MAGMA, or molten rock, are permeable to the ore-bearing solutions, or can be dissolved and then replaced by the minerals in solution, such rocks may be impregnated with the metallic minerals, producing a contact metamorphic deposit. This type of ore body is usually a large, irregular mass lying in the rocks near the igneous intrusion, often containing chalcopyrite, BORNITE, SPHALERITE, MOLYBDENITE, magnetite, pyrite and pyrrhotite. The GANGUE, or non-metallic, valueless minerals are the minerals of the metamorphosed or altered rock. Among them may be GARNET, EPIDOTE, DIOPSIDE, CALCITE and QUARTZ. These bodies are formed at temperatures between 300° and 600° C.

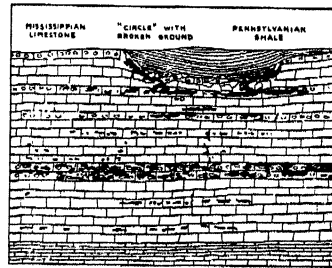


FROM W. H. EMMONS. PRINCIPLES OF ECONOMIC GEOLOGY, MCGRAW-HILL BOOK CO

A CONTACT-METAMORPHIC ORE DEPOSIT PRODUCED BY A GRANODIORITE INTRUSION INTO LIMESTONE

If the intrusion has opened cracks and fissures in the surrounding rocks, the ore solutions, or ore magmas or melts, may be forced into these as the parent intrusion cools, contracts and solidifies. There they will crystallize and solidify, producing VEIN deposits which contain the metallic ore minerals intergrown with the earthy, gangue ones, but usually quite distinct from the containing rocks, or wall rocks. The shapes and attitudes of these veins will depend on the nature of the rocks in which they occur. They are usually tabular and vary from vertical to horizontal.

Firm rocks capable of breaking in long, open fractures will have these filled with strong, persistent veins. More friable ones will show small, overlapping veins, and flexible ones like shale may not fracture at all, and carry only minor infiltrations of ore material. If the rock through which the ore solutions pass is soluble, like limestone, the vein character of the deposit may be obscured, and the rock itself be replaced by ore material. Large, irregular masses are thus formed, often extending long distances from the channel through which the solutions came. Other forms of deposits are recognized, depending on the peculiar conditions of the rocks at the time of ore infiltration.



FROM WALDEMAR LINDGREN. MINERAL DEPOSITS, MCGRAW-HILL BOOK CO

ONE FORM OF LEAD AND ZINC ORE DEPOSITS

*Galena and sphalerite have irregularly replaced beds of siliceous limestone and dolomite. This type of deposit is common in Missouri, the origin of the ore there is still uncertain*

In the process of vein formation, the ore solutions or magmas encounter decreasing temperatures and pressures as they recede from the parent igneous magma. As a result there is a progressive change in the ore and gangue minerals formed. This is summarized in the accompanying table. Some PEGMATITE dikes, containing WOLFRAMITE, TANTALITE, MOLYBDENITE, MONAZITE and other rare metallic and non-metallic minerals are transitional from magmatic segregations in igneous rocks to vein formations. If vein forming activities reach the surface, they do so as hot-springs and FUMAROLAS in volcanic regions, sometimes depositing such minerals as CINNABAR, SULPHUR and ORPIMENT.

Pyrite is found practically throughout the entire range of ore deposition, MARCASITE occurs near the surface, and pyrrhotite in the deep vein zone. Although metallic they may be considered as gangue since they are usually valueless.

The succession outlined is an ideal one, not to be expected in its entirety in nature. Seldom are there more than two or three metals present in a related series of deposits, and varying conditions of heat and pressure during formation may have produced a telescoping of one zone into another, or even a reversal of the normal series. The principle is of practical use, however, in PROSPECTING and in orienting MINE DEVELOPMENT. Deeper EROSION is necessary to expose the deep vein deposits than is required to reveal the

**TABLE OF CHANGES IN ORE DEPOSITS AT PROGRESSIVELY GREATER DISTANCES FROM THE IGNEOUS SOURCE**

APPROXIMATE DEPTHS AND TEMPERATURES OF FORMATION	PRINCIPAL METALS FOUND	COMMON METALLIC MINERALS	USUAL GANGUE
Shallow zone, near surface, formed about boiling water temperature.	mercury	cinnabar	kaolin alunite adularia chalcedony barite fluorite quartz calcite rhodochrosite pyrite marcasite
	antimony	stibnite	
	gold	gold, calaverite	
	silver	silver, argentite, silver-bearing tetrahedrite	
Intermediate zone, about a mile deep, forming between 150 & 300° C		galena, sphalerite, pyrite, chalcopryrite.	
	barren zone	pyrite	
	silver	argentite, tetrahedrite	quartz siderite calcite rhodochrosite pyrite
	lead	galena	
	zinc	sphalerite	
Deep vein zone, from one to six miles in depth, consolidating between 300 & 600° C	copper	chalcopryrite tetrahedrite enargite	
	gold	gold, gold-bearing pyrite and arsenopyrite	quartz, pyrite
	bismuth	bismuth, bismuthinite	quartz garnet mica
	arsenic	arsenopyrite	amphiboles pyroxenes tourmaline
	tungsten molybdenum tin	wolframite molybdenite cassiterite	topaz pyrite pyrrhotite

shallow zone veins. Since the parent igneous intrusion is usually deep seated, such as a BATHOLITH, only the deeper erosion will reveal the close relationship of ore genesis and igneous rock formation.

Deep vein deposits are of the type of the copper-tin veins of Cornwall and the Homestake gold lode of South Dakota, while the gold-quartz veins of California and the zinc-lead-silver deposits of Utah are representative of the intermediate zone. The Comstock lode is a shallow zone gold deposit.

When exposed at the surface, Ore Deposits are acted upon by WEATHERING and erosion, forming a GOSSAN of oxidized material. In tropical climates basic rocks high in IRON may have nearly everything but the iron oxides, themselves a product of weathering, removed by Erosion, leaving a residual or "lateritic," iron ore body. The values of lower portions of outcropping deposits may be enhanced through SECONDARY ENRICHMENT. PLACER deposits are formed by the weathering of veins or rocks containing such resistant

minerals as Gold, Platinum and Cassiterite, these minerals being carried away by running water, later to settle to the bottom in quieter stretches of the stream. The discovery of the gold placers of California caused the famous rush of 1849.

The great iron deposits of the Lake Superior region are the result of the weathering of igneous rocks and the carrying away of the iron in solution, probably as the carbonate. It was deposited as a chemical sediment, mostly in the form of iron silicate, interbedded with silica similarly deposited, in a body of water. These beds were later contorted during crustal movements and, still more recently, weathering has transformed most of the iron-bearing beds near the surface to minable HEMATITE and LIMONITE. JASPER and CHERT are familiar minerals in these beds.

Native copper has been deposited by circulating water in the AMYGDULES of ancient lava flows near Calumet, Mich. Copper sulphides in the shales of Mansfeld, Germany, are thought by some to have been precipitated therein as the result of bacterial action on copper-bearing stream waters. Limonite, in the form of bog-iron ore, is also a bacterial precipitate in some lakes and swamps.

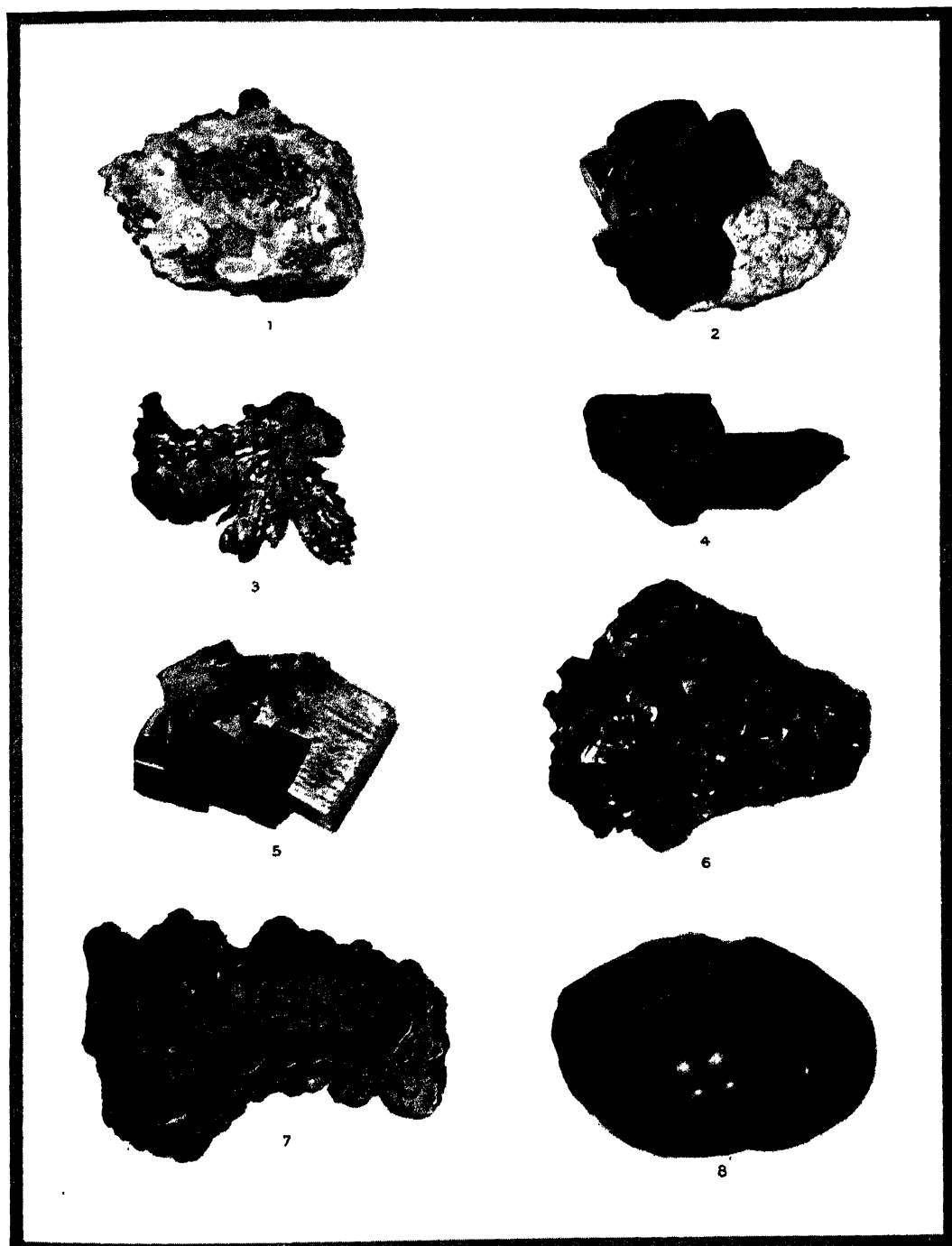
The search for ore deposits, in which the principals of origin must play a tremendously important rôle, is the province of PROSPECTING. Their development and exploitation are the problems of METAL MINING. See also GEOPHYSICS; VOLCANISM; PETROLOGY; METALS, NATIVE; MINERALOGY; LATERITE. S. F. K.

BIBLIOGRAPHY.—W. H. Emmons, *Principles of Economic Geology*, 1918; J. E. Spurr, *Political and Commercial Geology*, 1920; J. E. Spurr, *The Ore Magmas*, 1923; Waldemar Lindgren, *Mineral Deposits*, 1928; Max W. von Bernwitz, *Handbook for Prospectors*, 1931; C. K. Leith, *World Minerals and World Politics*, 1931.

**ORE ENRICHMENT, SECONDARY**, a natural process of WEATHERING which has taken place in many ORE DEPOSITS whereby the metallic content of the ore near the surface has been dissolved and reprecipitated lower down, thereby enriching lower portions of the deposit. Often it is due solely to this that the ore is sufficiently rich to mine.

Exposed, or outcropping ore minerals are subject to chemical attack by the atmosphere and moisture. These agents tend to transform them into oxides, carbonates and hydrates. When, as is usually the case, sulphide minerals or compounds of sulphur and metals, are abundant, the chemical action of water on them forms sulphuric acid and sulphates. The soluble minerals in the ore, GANGUE, and rock are thus attacked, dissolved, and carried away, while the less soluble ones remain as residual material. Metals combined with sulphur, arsenic, antimony and other elements, are transformed into oxides, carbonates, sulphates, and native metals, and some of these are then dissolved and transported. The usual residual products are QUARTZ, KAOLIN, LIMONITE, and manganese oxides, outcropping as a yellow or brown, somewhat porous mass, known as GOSSAN. This is often a good indication of underlying ore minerals. Gold and platinum, due to their resistance to chemical attack, are

## ORE DEPOSITS



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## ORE MINERALS

1. Crystallized gold on quartz. 2. Crystals of galena (black), on dolomite (pink). 3. Native copper and silver, crystallized together. The green material is tarnish on

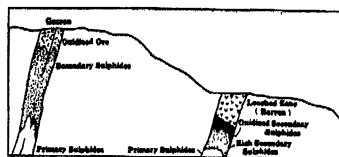
the copper. 4. Sphalerite. 5. Crystals of pyrite. 6. Crystals of chalcopyrite. 7. Concretion of azurite (blue), and malachite (green). 8. Nodule of hematite.





usually residual, and the dissolving out of worthless gangue minerals leaves these metals present in relatively higher proportions.

These processes of oxidation go forward in the "zone of oxidation," which lies between the earth's surface and the WATER TABLE or level of permanent saturation of the rocks. In arid regions this may



FROM WALDEMAR LINDGREN, MINERAL DEPOSITS.  
MCGRAW HILL BOOK CO

OXIDATION AND SECONDARY ENRICHMENT IN PYRITIC VEINS

*In the vein at the right, the gossan has been eroded, and the upper part of the secondary sulphide zone has been reached, causing a thinner but richer zone of secondary sulphides lower down*

extend to depths of 1,000 ft. Carbonates and oxides of the metals are sometimes deposited in it, especially if such a precipitant as calcite or limestone, be present. Rich deposits of the copper carbonates, MALACHITE and AZURITE, are found in the arid regions of southwestern United States.

Metals not deposited in the zone of oxidation are usually precipitated when they reach the water table. This is called the zone of secondary enrichment. Changed chemical conditions, and precipitants in the form of sulphides, especially pyrite, bring about the precipitation of the metals, usually as sulphides. They line open spaces, coat other minerals, or even replace them. For example, the copper, from sulphides near the surface may be carried down and reprecipitated as the sulphides CHALCOCITE, BORNITE and even CHALCOPYRITE. Deposits of silver, zinc and other metals, also undergo secondary enrichment. The process is less important with lead minerals, because of their relative insolubility. Oxide ores of iron are enriched through the removal of other, valueless minerals, since the iron oxides, LIMONITE and HEMATITE, are relatively stable in the zone of oxidation.

The factors that govern secondary enrichment are principally those affecting the circulation of water in the deposit. The climate, the topography, the position of the water table, the porosity of the ore body and of the surrounding rocks, underground water channels, are evidently important. The character of the minerals, their relative abundance, as well as structural condition, will affect the rates at which the ore minerals are attacked, dissolved, and reprecipitated.

The zone of secondary enrichment usually represents the accumulation, through long geological ages, of the minerals dissolved from those higher portions of the deposit which have long since been carried away by EROSION. Metallic values originally spread through a much greater volume have thus become concentrated into a narrow band. Evidently, in the PROSPECTING for ore, it is an important point to de-

termine whether or not such a zone may be anticipated.

S. F. K.

BIBLIOGRAPHY.—W. Lindgren, *Mineral Deposits*.

**OREGON**, one of the Pacific coast states of the United States, popularly called the "Beaver State." It is situated between 42° and 46° 18' N. lat. and 116° 33' and 124° 32' W. long. It is bounded on the north by Washington, on the east by Idaho, on the south by Nevada and California, and on the west by the Pacific Ocean. Natural boundaries are formed in part between Washington and Oregon and Idaho and Oregon by the Columbia and Snake rivers respectively. Oregon comprises an area of 96,699 sq. mi., inclusive of 1,092 sq. mi. of water surface. In size Oregon ranks ninth among the states of the Union.

**Surface Features.** Oregon is made up of a section of the Columbia Plateau and a Pacific border province separated by the Cascade Mountains. Its mean elevation above sea level is 3,300 ft., and its highest altitude 11,253 ft. on Mt. Hood.

The Columbia Plateau is a high lava plain diversified by groups of lava cones, and short mountain ranges. The most continuous range is the Blue Mountains extending from the northeast corner southwestward into Grant Co. Between them and the Cascades is a region of considerable rainfall, crossed by several streams which cut steep gorges in the basalt on their way to join the Columbia. Of special interest is the Deschutes River which from Cline Falls to its mouth flows in a canyon 500 to 2,000 ft. deep.

In central Oregon, south of the Crooked River, is an area of internal drainage known as the Harney section where the scanty streams disappear in the porous soil or end in alkaline lakes such as Malheur and Harney. Between these lakes and the Cascades is the Great Sandy desert, the soil of which is broken-up pumice. Its central and western parts are dotted by volcanic cones, mostly not more than 200 ft. high. This section has an average altitude of 4,000 ft. and merges with the Great Basin which extends into southern Oregon from Nevada.

Overlooking the Columbia Plateau from the west is the Cascade range, built up mostly of volcanic formations. Its general crest line is 5,000 to 6,000 ft. high, above which rise isolated cones, notably Mt. Hood, Mt. Jefferson, Mt. Washington, Three Sisters, Mt. Theilson and Mt. McLoughlin. South of the 44th parallel a spur, the Calapooya Mountains, connects the Cascades with the Oregon Coast range. Toward the southern boundary the Cascades lose their linear crest and dissolve into a belt of volcanoes rising from a high lava field. The best known feature of this



OREGON STATE SEAL

section is Crater Lake situated 6,117 ft. above sea level.

West of the Cascades is the Willamette valley and still farther west the Oregon Coast range and the coastal plain. The valley, 125 mi. long and 20 to 30 mi. wide, is a flat alluvial plain comprising the most important agricultural section of Oregon. It is drained by the Willamette River, a tributary of the Columbia. The Oregon Coast range is generally 3,000 to 3,500 ft. in height and luxuriantly wooded. Between it and the Pacific is a narrow coastal plain which in places widens to form sandy beaches and at other points almost disappears as the mountains reach to the water's edge.

**Climate.** On account of the separation of the state by the Cascade ranges into a coastal and an interior region, Oregon displays two distinct types of climate. The coast is mild, damp and equable, but the interior, embracing the eastern two-thirds of the state, is dry and subject to great changes in temperature. For the entire state the mean annual temperature is 49.1° F., varying from 53.1° F., with an average of 39.4° F. for January and 66.7° F. for July, at Portland to 44° F. in the Great Basin region. During the period 1890-1930 the highest temperature recorded in Oregon was 119° F. and the lowest, -47° F. The average annual precipitation is 31.3 in., varying from more than 100 in. in the northern Coast ranges to only 8 in. in the arid districts of the southeast. At Baker, in the eastern interior, there are 145 days in the average growing season; at Portland there are 246 days.

**Forests and Parks.** The forests of Oregon cover approximately 26,000,000 acres and contain practically 1/5 of all the timber in the United States. The heaviest growths lie west of the Cascade Mountains and comprise some of the best timber stands in the world. The principal tree is the Douglas fir which occurs in almost pure stands and is best developed on the alluvial soils of the coastal region. It grows throughout the western part of the state, with the exception of a few dry valleys, and from sea level to 6,000 ft. and sometimes 7,200 ft. elevations. In the eastern part the Douglas fir extends up the Columbia River valley as far as the Hood River but is there superseded by the Ponderosa pine as the chief commercial tree. Other important trees are the western yellow pine, white pine, western hemlock, western red cedar, spruce and white fir. Scattered hardwoods include oak, maple, cottonwood and ash. The state has one of the finest fire protective systems in the country; practically every acre of forest land being under the supervision of some organization. Extensive forest lands are owned by the Federal Government, including 15 national forests with a total net area in 1930, of 13,407,810 acres and 1,162,900 acres of Indian Reservation lands. The national forests include all the higher mountain areas of the Cascades, Coast Range, and Blue Mountains. They are developed for recreational use and are a mecca for campers. The state owns but 81,562 acres of forest land; the remainder being in private hands. Oregon

has a novel system of 45 state highway parks. These vary in size from less than an acre to 1,100 acres in the Humbug Mountain Park, a picturesque region bordering the Pacific Ocean in the southwestern part of the state, and 1,600 acres in Picture Gorge, a geological area in eastern Oregon of national importance because of its exposed geological strata representing eight periods. Many of these Highway parks have been developed for camping. OREGON CAVES National Monument administered by the Department of Agriculture lies within Siskiyou National Forest; CRATER LAKE National Park within Crater National Forest.

**Minerals and Mining.** The mineral resources of Oregon, although varied, are on the whole of slight economic importance. They include chiefly building stone and sand, gravel and clay deposits, but several metals, as gold, mercury and copper, are produced in varying quantities. Iron ore is sparingly found and there are coal deposits at Coos Bay. With mineral productions in 1929 amounting to \$6,876,703, Oregon stood fortieth among the states, ranking third in mercury and tenth in gold. The principal products in order of value were stone, 1,951,890 tons, \$1,905,747; cement, about \$1,700,000; sand and gravel, 2,257,338 tons, \$1,508,787; clay products, \$709,494; mercury, \$446,684; gold, \$353,323; basalt, \$309,766; and copper, \$115,411. During 1929 65 mines and quarries gave employment to 905 persons who received \$1,406,193 in salaries and wages.

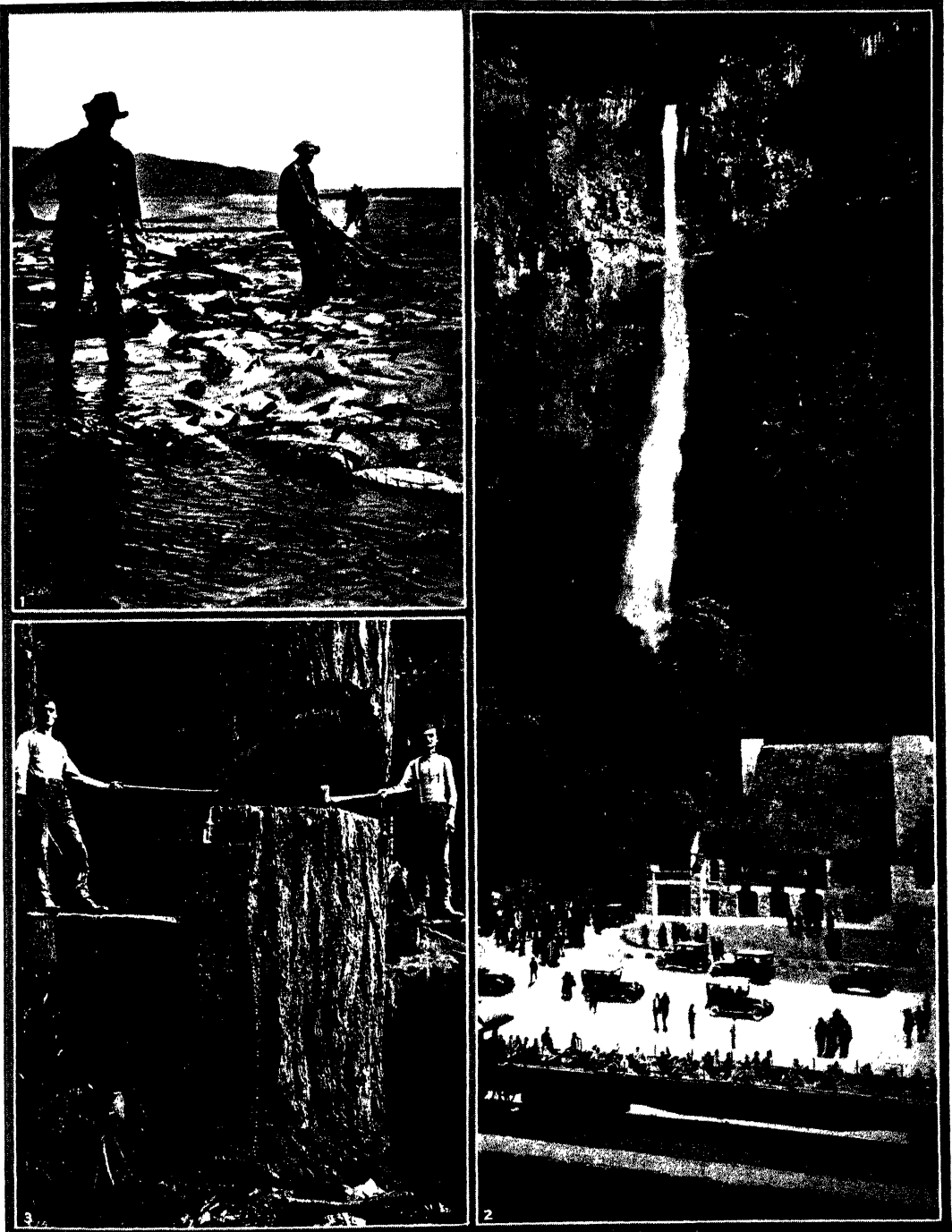
**Soil.** Along the Pacific coast the soils of Oregon are sandy and clay loams, rich in vegetable mold. The valleys of the larger rivers, as the Willamette, Rogue and Umpqua, possess much fertile alluvium. Eastern Oregon contains extensive areas of soils of volcanic origin derived chiefly from volcanic ash and decomposed lava. They are fertile when not too highly alkaline, but irrigation is usually necessary for crop production in most sections.

**Agriculture.** The principal farm products are grain, hay, fruits, nuts and vegetables.

In 1930 16,548,678 ac. or 27.0% of the entire land area was in farms, 55,153 in number, with an average size per farm of 300.1 ac. and an average value per acre of \$38.12. Of the farm area 4,172,519 ac. was crop land; 11,378,824 ac., pasture land; and 502,737 ac., woodland. The total value of farm property was \$755,896,689, of which \$630,827,927 was represented by land and buildings; \$42,585,751, by implements and machinery; and \$82,483,011, by domestic animals.

According to the census of 1930 Oregon produced in 1929 field crops to the value of \$89,313,547, ranking thirty-second among the states. It stood second in plums and prunes and walnuts, third in pears and blackberries, fourth in raspberries, fifth in cherries and strawberries and ninth in apples. The chief crops were grain \$32,503,925, hay \$25,543,466, fruits and nuts \$18,153,980, and vegetables \$10,300,453. In wheat production the state stood thirteenth with 21,526,667 bu. grown on 1,075,241 ac. Other grain crops were oats, 7,613,345 bu., and barley, 2,373,155

## OREGON

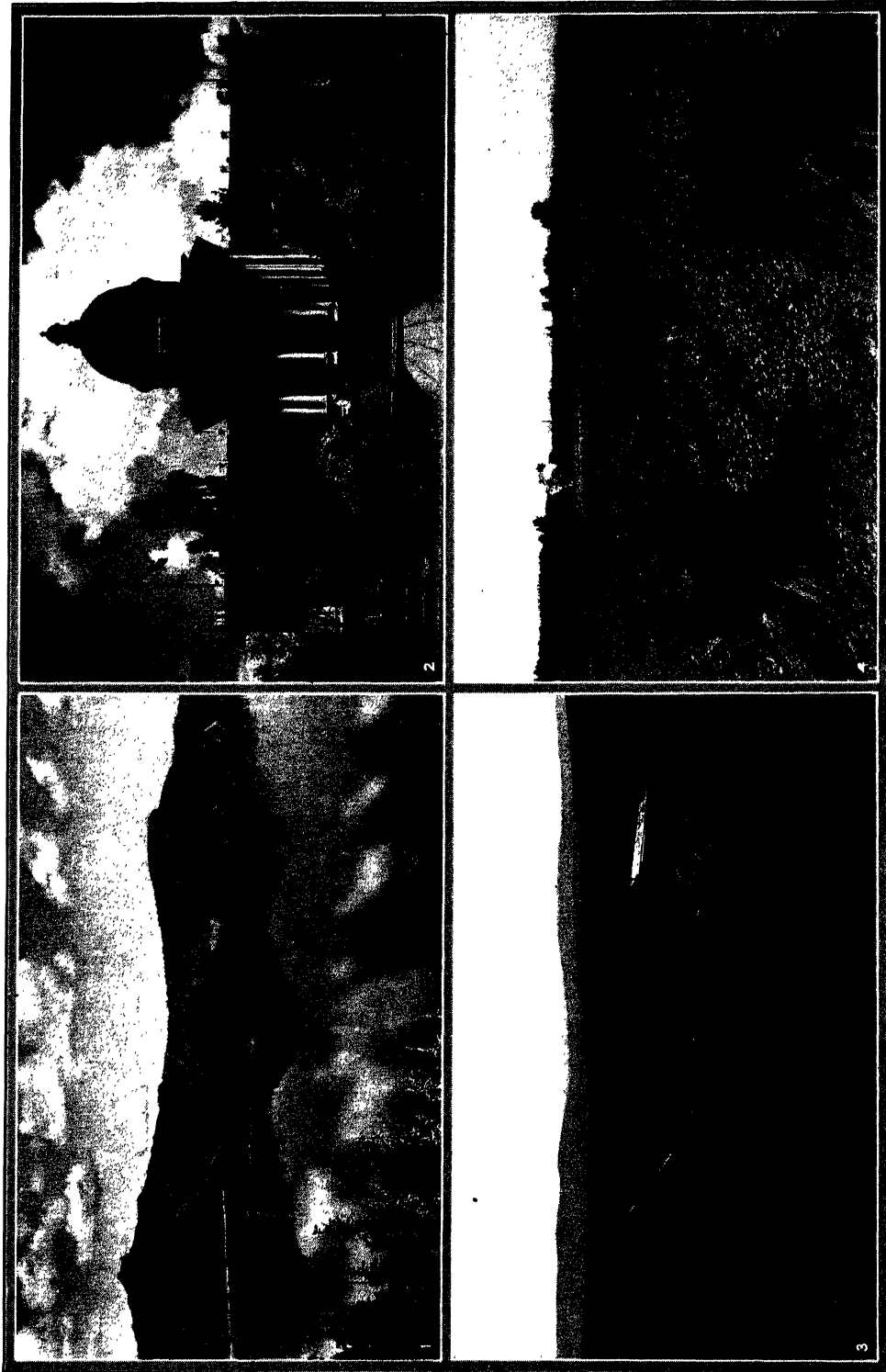


COURTESY OREGON STATE CHAMBER OF COMMERCE, COPYRIGHT ARTHUR M. PRENTIS

### INDUSTRY AND RECREATION IN OREGON

1. Pulling in the salmon nets at Astoria at the mouth of the Columbia River. 2. Multnomah Falls, a popular resort about 30 miles east of the city of Portland. 3. Oregon lumbermen felling a Douglas fir tree, more than 200 feet high.

# OREGON



1. 4. COURTESY OREGON STATE CHAMBER OF COMMERCE. COPYRIGHT ARTHUR M. PRENTISS; 2. COURTESY SALEM CHAMBER OF COMMERCE; 4. CATERPILLAR TRACTOR CO.

## CHARACTERISTIC SCENES IN THE STATE OF OREGON

1. Wizard Isle in the middle of Crater Lake, 6,117 ft. above sea level.
2. The imposing Oregon State Capitol at Salem.
3. Harrowing ground with a tractor-harrow in the Oregon wheat fields.
4. Flax gathered in shocks on a farm near Salem.



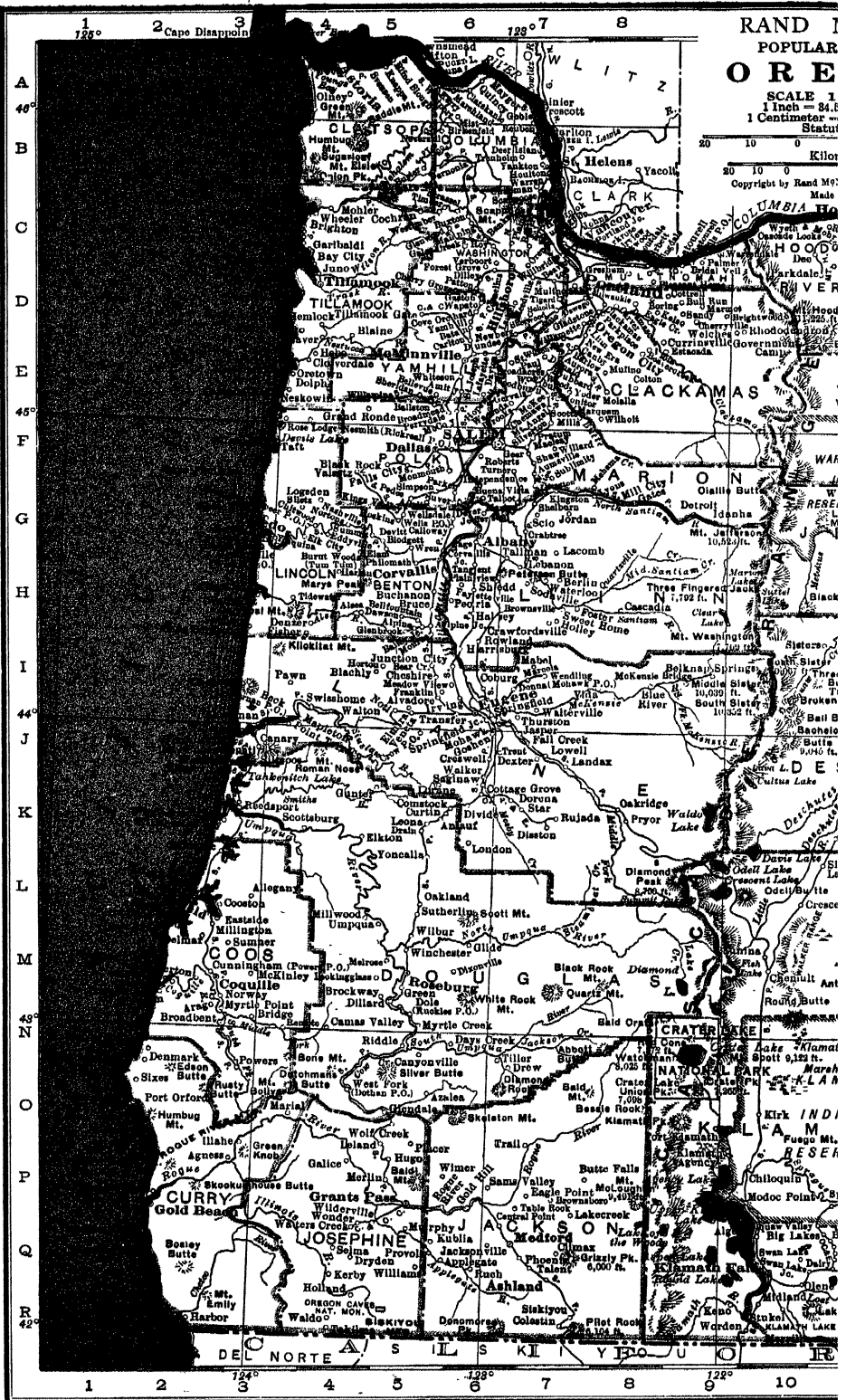
# OREGON

Area, 96,699 sq. mi.

Pop. 953,786

## PRINCIPAL CITIES

Pop.—Thousands	
5 Albany	... G 6
5 Ashland	... Q 7
10 Astoria	... A 4
8 Baker	... G 22
2 Bandon	... M 2
1 Beaverton	... D 7
9 Bend	... J 11
3 Burns	... L 18
3 Coquille	... M 2
8 Corvallis	... G 5
2 Cottage Grove	... K 6
3 Dallas	... F 5
1 Enterprise	... D 23
19 Eugene	... J 6
2 Forest Grove	... K 6
1 Gladstone	... D 8
5 Grants Pass	... P 5
2 Gresham	... D 8
1 Heppner	... D 16
3 Hillsboro	... D 6
3 Hood River	... C 11
1 Independence	... F 6
16 Klamath Falls	... F 6
8 La Grande	... E 21
2 Lakeview	... Q 14
2 Lebanon	... H 7
3 McMinnville	... D 6
5 Marshfield	... L 2
11 Medford	... Q 6
2 Milton	... B 20
2 Milwaukie	... D 7
1 Mount Angel	... F 7
1 Myrtle Point	... N 3
3 Newberg	... E 6
2 Newport	... G 3
4 North Bend	... L 2
2 Ontario	... J 24
6 Oregon City	... D 7
1 Oswego	... D 7
7 Pendleton	... C 19
302 Portland	... D 7
1 Prineville	... I 13
1 Rainier	... A 6
1 Redmond	... I 12
1 Reedsport	... K 3
4 Roseburg	... M 5
4 St. Helens	... B 7
26 Salem	... F 6
2 Seaside	... F 4
1 Sheridan	... E 5
2 Silverton	... F 7
2 Springfield	... J 6
6 The Dalles	... C 12
3 Tillamook	... G 3
2 Toledo	... G 3
1 Union	... E 22
2 Vernonia	... B 6
2 West Linn	... D 7
1 West Salem	... F 6
2 Woodburn	... E 7
Pop.—Hundreds	
6 Arlington	... C 15
5 Athena	... C 20
7 Brownsville	... H 7
7 Canby	... E 7
7 Carlton	... E 6
8 Central Point	... Q 7
5 Chiloquin	... P 10
7 Clatskanie	... A 6
9 Condon	... E 14
5 Cornelius	... D 6
5 Drain	... K 3
6 Eastside	... M 3
7 Elgin	... C 21
5 Empire	... L 2
5 Estacada	... D 9
5 Falls City	... F 15
5 Fossil	... F 15
7 Freewater	... B 20
5 Glendale	... O 5
5 Gold Hill	... P 6
6 Harburg	... F 6
6 Hermiston	... B 17
8 Huntington	... H 23
7 Jacksonville	... Q 6
5 Joseph	... D 23
9 Junction City	... E 5
7 Molalla	... E 8
9 Monmouth	... F 5
8 N. Powder	... F 21
8 Nyssa	... J 24
7 Philomath	... H 5
8 Stayton	... G 7
5 Sutherlin	... L 5
6 Tigard	... D 7
9 Vale	... J 23
7 Walla	... C 22
7 Warrenton	... A 4



RAND 1

POPULAR

ORE

SCALE 1  
1 inch = 34.5  
1 Centimeter =  
Statute

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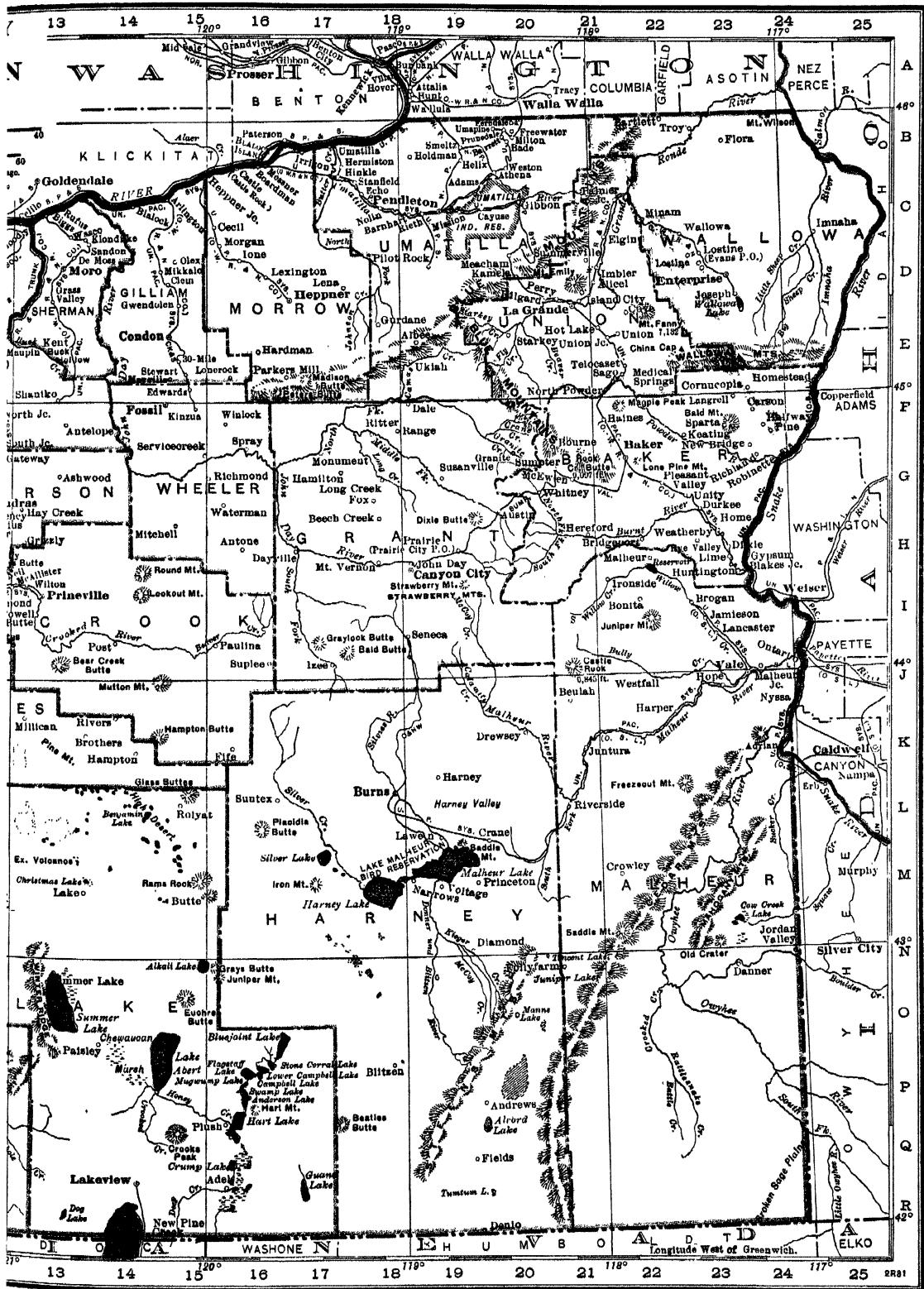
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bu. Of the hay crop, 1,827,537 tons, alfalfa furnished 635,990 tons. The leading fruit and nut crops were plums and prunes, 5,749,371 bu.; apples, 3,506,099 bu.; pears, 2,482,534 bu.; cherries, 290,735 bu.; peaches, 226,593 bu.; strawberries, 19,203,588 qts.; loganberries, 5,726,080 qts.; raspberries, 5,202,357 qts.; blackberries, 3,204,191 qts.; walnuts, 2,484,004 lbs., and hazelnuts, 358,257 lbs. The principal vegetables were potatoes, \$4,907,248; celery, \$390,316, and dry onions, \$343,761. Farm products sold by cooperative marketing rose from \$7,746,624 in 1919 to \$11,366,895 in 1929. Farm machinery and equipment in 1930 included 47,440 automobiles, 9,741 motor trucks, 9,838 tractors, 9,010 electric motors, 17,189 stationary gas engines.

**Irrigation.** East of the Cascade Mountains and in some parts of the southwest irrigation is necessary for crop production. Irrigation is most extensively developed in the basins of streams flowing into the Columbia River, especially the Snake, with many confluents, and the John Day and Deschutes rivers. These streams, together with the Klamath and Rogue rivers with their tributaries in the south and southwest, supply water for three-fourths of the state's irrigated acreage.

According to the Census of 1930 irrigation operations were reported for 25 of the 36 counties in the state. Irrigated farms comprised 20.6% of the number and 26% of the value of all farms in Oregon. Slightly more than one-fifth of the crop land was irrigated. The proportion irrigated was 5.4% of the area of all farms and 1.5% of the land area of the state.

The total number of irrigated farms was 11,387, with an aggregate area of 6,306,825 ac., of which 898,713 ac. were irrigated. Including land and buildings the value of all irrigated farms was \$160,397,926, or an average of \$25.52 per ac. The total investment in irrigation enterprises to 1930 was \$38,754,548, and the average cost of maintenance and operation for 1929 was \$1.41 per ac.

**Animal Industry.** Cattle-raising and sheep-raising are the chief livestock interests. According to the census of 1930, Oregon stood fifth among the states in number of sheep on farms and seventh in pounds of wool shorn. The state ranked twenty-fourth in total value, \$82,483,011, of domestic animals on farms. Among these were 805,120 cattle, valued at \$42,660,597; sheep, 3,319,271 in number valued at \$22,936,586; horses, 178,875, \$10,191,041; mules, 13,455, \$781,901; swine, 224,539, \$2,562,539, and goats, 138,349, \$506,716.

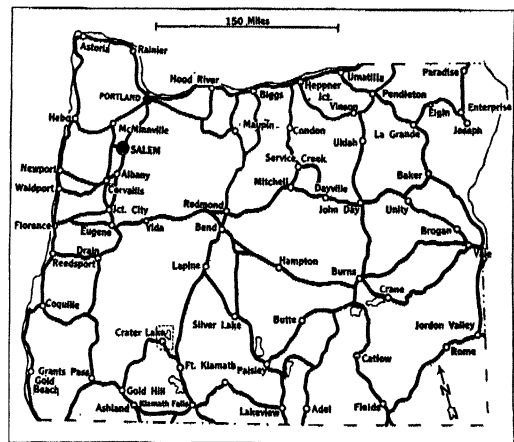
Of the cows on farms, 252,546 were kept mainly for milk production and 187,108 mainly for beef production. In 1929, 135,376,656 gals. of milk were produced; the total value of dairy products sold was \$20,933,138. The value of all poultry raised was \$6,217,603. The number and value of the chief kinds were chickens, 4,613,073, \$4,228,418, and turkeys, 600,359, \$1,882,263. The chickens sold, 1,849,966 in number, were valued at \$1,707,802. Of 28,342,459 doz.

chicken eggs produced, valued at \$9,134,412, 21,040,447 doz., with a value of \$6,776,747, were marketed. The wool clip, 17,946,190 lbs., was valued at \$5,245,983. Honey, amounting to 1,066,939 lbs. valued at \$130,532, was produced from 33,849 hives.

**Fisheries.** In 1930, Oregon ranked fourteenth in the value of its commercial fisheries, the year's catch amounting to 25,284,000 lbs., valued at \$2,605,000. Salmon from the Columbia River district is by far the most valuable fish taken, making the greater part of the catch. Other species are halibut, cod, smelt, flounders and rockfish. Inland waters furnish superlatively fine fishing.

The state issued 78,750 fishing licenses in 1930 and received \$270,345 in fees. Thirty-nine fish hatcheries were operated by 135 men and \$255,717 was spent on fish propagation, an amount exceeded by only three other states. The year's output included 22,943,397 trout, 491,400 bass, 2,351,031 other game fish and 92,912,047 commercial species. There is very close cooperation with the United States Bureau of Fisheries which operates three salmon-egg collecting and hatching stations in the state, from which were planted in Oregon waters in 1930, 2,095,000 chinook salmon, 3,425,000 steelhead salmon, 373,000 silver salmon, 90,000 other salmon, 225,250 loch leven trout and 157,250 rainbow trout.

**Transportation.** The Columbia and Willamette rivers and the Pacific Ocean afford Oregon adequate transportation facilities by water. Portland, on the Columbia River, is by far the largest port in the state, and one of the most important on the Pacific coast. With the exception of the arid region east of the Cascade Mountains, which has very little railway service, the state is intersected by a network of railroads affording service sufficient for the region's re-



OREGON STATE ROADS

quirements. In 1930 the total steam railway mileage was 3,488, with the Great Northern, the Northern Pacific, the Union Pacific, and the Southern Pacific the most important systems.

Since 1917 the state highway system has shown consistent extension and improvement. There were 63,769 mi. of highways on Jan. 1, 1930, including 12,123 mi. of surfaced roads and 3,543 mi. of improved state highways. Gasoline consumption during 1930 totaled 170,169,000 gals. Highway expenditures during 1929 were \$21,332,834, of which \$9,502,834 was paid by the state and \$11,830,000 by county and local governments. State gasoline tax collections were \$6,198,777 in 1930, almost double the \$3,333,829 reported in 1926. Motor vehicle registrations were 252,123 in 1930 compared with 216,553 in 1925. Bus operations and trucking facilities also showed considerable expansion during that five-year period.

**Manufactures.** The leading manufacturing industries have been developed by utilization of the state's forest and agricultural resources.

According to the Census of 1930 Oregon with manufactures for 1929 valued at \$411,768,975 stood thirtieth among the states, ranking second in lumber and timber products, fourth in cheese, sixth in canning fish and ninth in canning fruits and vegetables. Its 2,463 establishments gave employment to 8,360 officers and employees, who received \$19,412,571 in salaries, and to 65,505 wage earners, who were paid \$86,828,968 in wages. These factories used a total of 418,324 horse power, expended \$6,672,400 for fuel and power, and \$198,554,790 for materials and supplies, and added by the process of manufacture \$206,541,785 to the value of their output.

In this output there were 78 separately enumerated industries. Of outstanding importance were forest products valued at \$168,095,170. This group, which included lumber, \$136,589,812; paper, \$16,229,279; planing mill products, \$8,500,649, and wood pulp, \$6,775,430, comprised 40% of the total manufactures. Among other important items were canned fruits and vegetables, \$24,603,741; flour, \$21,145,298; meat packing, \$18,745,443; printing and publishing, \$15,390,659; foundry and machine shop products, \$13,277,562; butter, \$11,773,909, and bread, \$10,888,264.

The principal manufacturing city was Portland; its output, valued at \$172,433,230, amounted to 42% of the state's manufactures.

**Commerce.** According to the census of 1930, there were in 1929 1,440 wholesaling establishments in Oregon, with total sales of \$466,851,451. These organizations gave full-time employment to 14,664 men and women, whose annual salaries and wages aggregated \$24,269,176. The chief wholesaling center is Portland.

#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Automotive .....	3,252	\$103,368,198	22.46
Food .....	3,944	101,758,260	22.09
General Mdse. ....	1,150	88,453,011	19.23
Lumber & Bldg. ....	868	29,953,367	6.50
Apparel .....	828	27,692,569	6.02
Furn. & Household ..	426	18,186,988	3.96
All other stores .....	4,162	90,788,254	19.74
Total, all stores ...	14,640	\$460,170,647	100.00

The total sales of the 14,640 retail stores amounted to \$460,170,647. Sales per store averaged \$31,432. Sales per capita which were \$482.50, were exceeded in only five other states.

Portland, the principal port, handled water-borne commerce amounting to 9,776,211 tons, with a value of \$349,735,747. Lumber, oil and wheat were the largest items.

**Finance and Banking.** The value of all taxable property in Oregon in 1929 was \$1,124,988,692. The basis of assessment was 60%. The total bonded debt in 1930 was \$60,339,510. Total state revenues in 1928 were \$23,813,975; total disbursements, \$21,812,077. The chief sources of income were property taxes, \$6,235,600 and licenses, \$12,376,000. This included taxes on insurance companies, corporations, motor vehicles and gasoline, \$3,887,228. The principal payments were for highways, \$9,489,641, debt service, \$2,326,962 and permanent improvements, \$954,977.

There were 225 banks in Oregon in 1930. Of these, 94 were national banks and 131 trust companies and state banks. Their total capitalization was \$22,176,000; their surplus and undivided profits, \$15,020,000. Total resources were \$325,338,000, with loans and discounts of \$140,267,000. Demand and time deposits totaled \$258,118,000. Per capita demand and time deposits were \$270.28; per capita savings deposits, \$123.41. The total savings of \$117,856,000 were owned by 365,682 depositors. National bank circulation aggregated \$5,761,000.

**Government.** The legislative body of Oregon consists of a Senate composed of 30 members and a House of Representatives of 60 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions limited in duration to 40 days. The chief executive is the governor, elected for a term of four years at a salary of \$7,500 per year. Other executive officers are the secretary of state and the treasurer. Judicial power is vested in a supreme court, circuit and county courts and justices of the peace. The supreme court consists of 7 judges elected for terms of six years at salaries of \$5,250 per annum.

**Social Welfare Institutions.** At Salem there are an industrial school for girls and a school for the blind, an institute for the feeble-minded and a tuberculosis hospital. A training school for boys is located at Woodburn. A hospital for the insane is at Pendleton, a tuberculosis hospital at The Dalles, and the Oregon State Hospital at Salem. A soldiers' home is maintained at Roseburg. At Portland is the Employment Institute for the Blind. The penitentiary is at Salem. State aid is given to private charitable institutions that make application and are passed on by the Board of Health. The State Child Welfare Commission inspects institutions for children and passes on petitions for adoption.

**Education.** The first schools were founded by missionaries along the Columbia and Willamette rivers. One of these was opened in 1835 near Champoege. The Indian Manual Training School was

founded by Methodists in 1842. A school law was enacted in 1849, and the first public school was opened in 1850 in Oregon City. In 1928 there were 2,598 public elementary schools, with 5,833 teachers and 144,851 pupils, and 266 public high schools, with 2,107 teachers and 42,338 pupils. School attendance is compulsory for children from 9 to 15 years.

The number of persons from 5 to 20 years of age attending school in 1930 was 197,719, or 75% of the population within the ages specified, as compared with 152,275, or 70.1%, in 1920. The number of persons, 10 years and over, unable to read and write in 1930 was 7,814, or 1%, as compared with 9,317, or 1.5%, in 1920. Foreign-born white illiterates numbered 3,743, or 3.6%, in 1930, and 5,172, or 5.1%, in 1920.

Among the institutions of higher learning maintained by the state are the University of Oregon at Eugene, the Oregon Agricultural College at Corvallis, and normal schools at Monmouth and Ashland. Other educational institutions include Pacific University at Forest Grove, Willamette University at Salem and Reed College at Portland.

**Population.** In 1930 Oregon ranked thirty-fourth among the states with a population of 953,786 or an average of 10.0 per sq. mi., an increase of 170,397 or 21.8% over 1920. The population rose from 13,294 in 1850 to 413,536 in 1900, 672,765 in 1910, and 783,389 in 1920. In 1930 there were 937,029 or 98.2% whites, 2,234 or 0.2% Negroes, and 4,776 or 0.5% Indians. Of the whites 831,554 were native-born and 105,475 were foreign-born. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 56,546 or 18.4% were German and 40,729 or 13.3% were Canadian other than French Canadian. The urban population was 489,746 or 51.3% of the total, an increase of 98,727 or 25.2% from 1920; the rural population was 464,040 or 48.7% of the total, an increase of 71,670 or 18.3% since 1920. In 1930 the six largest cities were Portland, 301,815; Salem, 26,266; Eugene, 18,901; Klamath Falls, 16,093; Medford, 11,007; Astoria, 10,349.

**Occupations.** In 1930 409,645 persons, or 42.9% of the population, were gainful workers 10 years old or older; 80.2% of these were males and 19.8% were females; 83.1% were native white; 15.0% were foreign-born white, and 1.6% other races. Among the chief occupations, with number of workers, were manufacturing, 107,166; agriculture, 81,879; trade, 55,449; domestic and personal service, 39,153; transportation and communication, 36,491; professional service, 31,947; clerical service, 30,520, and forest industries, 16,565.

#### HISTORY

Oregon was first used in 1767 by Maj. Robert Rogers, who applied it in an outline of plans for an exploring expedition to a great river of the Northwest of which rumors were current. Afterward it was used to designate the whole country drained by that stream, the Columbia River. Probably the coast of the present state was first seen by white men in 1543 when the Spaniard, Bartolome Ferrello, may

have sailed up to it from the south. During the next two centuries several navigators, English and Spanish, coasted along the shore. The first European to sail along the entire coast line was Juan Perez in 1774; in the following year another Spaniard, Bruno Heceta, made the first landing near Point Grenville, and claimed the region for Spain. In 1791 Boston merchants sent fur traders to the Pacific coast; one of these, Capt. Robert Gray, discovered in 1792 the long-sought river, and named it the Columbia, after his ship. His discovery gave the United States a claim to the entire territory drained by its waters. In 1805-06 the LEWIS AND CLARK expedition crossed the Rocky Mountains, and explored the Columbia to its mouth. The first permanent settlement, Astoria, was founded in 1811 at the mouth of the Columbia River by agents of John Jacob Astor's American Fur Company, who also established other posts inland. During the war of 1812 all United States interests withdrew from the Oregon region; Astoria was sold to a British company and renamed Ft. George. After the war ownership of the Oregon country was so hotly contested by the two nations that at times renewed hostilities seemed likely, but joint occupation west of the Rocky Mountains was agreed upon in 1818 and continued until 1846. During these years several mission settlements were made by Americans, the most important being those by Jason Lee and Marcus Whitman. In fur trading the HUDSON BAY COMPANY monopolized the region and sent Dr. John McLoughlin, sometimes called the Father of Oregon, to rule it. His most important settlement was the beginning of Oregon City. The first immigrant train came over the OREGON TRAIL in 1842. The next year brought many settlers, but conditions were unsettled because of the conflicting British and American claims. The settlement of the boundary controversy was one of the issues of the Presidential campaign of 1844 when the slogan of the Democratic party was "fifty-four forty or fight." The present northern boundary of the disputed region was fixed by treaty with Great Britain in 1846. On Mar. 3, 1849, the Territory of Oregon was organized, including WASHINGTON and IDAHO and part of MONTANA, the matter having been delayed by discussion of whether or not slavery should be forbidden.

Oregon with its present boundaries was admitted as a state on Feb. 14, 1859, with a population of 52,400 and its capital at Salem, where it has since remained. Although its growth was slow until the coming of railroads and capital made possible the exploitation of its immense and varied natural resources, its progress has since been steady and substantial. The state was among the first to adopt such modern developments of democratic government as the recall, the Presidential primary, direct nominations and the initiative and referendum. Although usually Republican, Oregon gave its five electoral votes to Franklin D. Roosevelt in 1932. Frederick Steiwer, Republican, was reelected to the United States Senate.

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**OREGON, UNIVERSITY OF**, at Eugene, Ore., a state institution for men and women established in 1872. In addition to the regular college course, the university maintains schools of Law, Medicine, Music, Education, Journalism, Architecture, Business Administration, Sociology and Physical Education, a Graduate School and an Extension Division. The grounds and buildings were valued in 1931 at \$4,491,822. In the library of 230,371 volumes is a special collection of newspapers of Oregon and the Pacific Northwest. The museum contains the Murray Warner Collection of Oriental Art and the Condon Geological Collection. In 1930-31 there were 3,610 students, and a faculty of 278 headed by Pres. ARNOLD BENNETT HALL.

**OREGON BOUNDARY TREATY**, an agreement ratified by Great Britain and the United States July 17, 1846. The Convention of Oregon, postponing the settlement of the conflicting claims to Oregon for a 10-year period of joint occupancy, was twice renewed. In 1846 Secretary of State Buchanan proposed the 49th parallel, N. lat., as a compromise line. Sir Richard Pakenham, British minister at Washington, refused to transmit the offer to his government. After President Polk had given notice of the intention of the United States to terminate the joint occupancy, Pakenham was instructed by his home government to accept the compromise. The treaty defined the northern boundary of American territory in Oregon as the 42d parallel from the Rocky Mountains to Vancouver Island, thence along the middle of the southerly channel to the Pacific.

**OREGON BOXWOOD** (*Pachystima Myrsinites*), a low evergreen shrub of the staff-tree family called



FROM JEPSON, MAN. FL. PLANTS CALIF., COPYRIGHT

OREGON BOXWOOD

Flowering branchlet and single flower

also mountain lover. The plant is found on wooded hills and mountains from Alberta to New Mexico and westward to British Columbia and California. Though sometimes prostrate, it usually grows 1 to

3 ft. high, bearing small, opposite, leathery leaves with minute reddish-brown flowers in their axils.

**OREGON CAVES**, a national monument in southwestern Oregon. A tract of 480 acres was set aside July 12, 1909 under the administration of the Department of Agriculture. The caves are of great beauty and variety and are located in Cave Mountain, a 6,000 ft. peak of limestone formation in Siskiyou National Forest. The main entrances are at an elevation of 4,000 ft. Within the caves the visitor is guided through extensive galleries, passageways, and an intricate network of tunnels of fantastic shape and strange and grotesque decoration. The caves are 49 mi. by motor road from Grants Pass which is on the Southern Pacific system and the National Park-to-Park Highway. The route from Grants Pass follows the Redwood Highway to a point about 1 mi. south of Kerby where the Caves Highway turns off and leads up to the monument. A chalet and bungalows provide attractive accommodations for visitors.

**OREGON CITY**, a city in northwestern Oregon, the county seat of Clackamas Co., situated on the Willamette River, 14 mi. south of Portland. The Southern Pacific Railroad, bus lines and river craft afford transportation. Oregon City is a market center for dairy products, poultry and fruit. Woolen goods and paper are its chief manufactures. Oregon City was the last stop on the old Oregon Trail for many pioneers between 1835 and 1850. It was the home of the first Federal Court and Land Office on the Pacific Coast and of the first newspaper to be published west of the Rocky Mountains. Founded in 1829, Oregon City was incorporated in 1844. Pop. 1920, 5,686; 1930, 5,761.

**OREGON GRAPE** (*Mahonia Aquifolium*), an evergreen shrub of the barberry family called also mountain grape. It is a native of rocky slopes from British Columbia to California with numerous foliage forms in cultivation. The erect stems, usually about 3 ft. high, bear pinnately divided, glossy, evergreen leaves with spiny toothed margins, showy yellow flowers and clustered, somewhat grapelike, blue fruit. Oregon has adopted this plant as the state flower.

**OREGON PINE**, a name given, especially in the lumber trade, to the DOUGLAS FIR, one of the most important North American timber trees.

**OREGON TEA-TREE** (*Ceanothus sanguineus*), a large shrub of the buckthorn family known also as buck-brush. It grows on mountain slopes from British Columbia to Montana and southward to northern California. The shrub attains a height of about 10 ft., bearing reddish branchlets, smooth, oblong, toothed leaves and numerous white flowers in dense clusters. The astringent leaves, like those of the allied New Jersey Tea, have been used as a substitute for tea.

**OREGON TRAIL**, from the Missouri River to the Columbia, the great highway of pioneers' emigration to the Oregon country. The history of its use by whites begins with the Astoria Expeditions. The route was used by fur traders, and bore the home-

seekers' emigration which began in 1841. Branching from the Santa Fe Trail somewhat northwest of the present Gardner, Kan., the Oregon Trail passed the site of Topeka, crossed the Black Vermilion River near the present Bigelow, was joined by a branch road from Leavenworth, crossed the Big Blue near the mouth of the Little Blue, and near this point was joined by a branch road from St. Joseph. It reached the Platte River about 20 miles below Grand Island, and followed the intermediate valley of the Platte to the junction of the Forks. Thence alternative routes led to Ash Hollow. The trail proceeded past spectacular landmarks, Court House Rock, Chimney Rock and Scott's Bluffs, to Ft. Laramie, where the American Fur Company road to the Upper Missouri diverged. It then followed the valley of the North Platte to one of several fords, the best near the present Caspar; continued to Independence Rock, along the Sweetwater River nearly to its source, to the South Pass, and thence southwest to Ft. Bridger (f. 1843) or more directly west by Sublette's Cut-Off; to Soda Springs, at the northern bend of Bear River; to Ft. Hall, on the Snake above the mouth of the Portneuf; to Ft. Boise; and into the Columbia River Valley. Francis Parkman's *Oregon Trail* and Joel Palmer's *Journal of Travels* are classic accounts.

**OREKHOVO-ZUYEVO**, an administrative center and manufacturing city in the Moscow Region of the R.S.F.S.R., about 55 mi. east of Moscow. It is situated on the right bank of the Klyazma River and has good rail communication. Its industrial character made Orekhovo-Zuyevo before the World War the scene of serious strikes and a headquarters of revolutionary activity. A large proportion of the city's inhabitants are employed in a large dye-works, a cotton-spinning mill and a weaving mill. Pop. 1926, 62,833.

**OREL**, administrative center of Orel district in the central Black Soil Region, R.S.F.S.R., situated about halfway between Moscow and KHARKOV, and well-connected by railroads. In the heart of farming country, and at the confluence of the Oka and Orlik rivers, it is an export center for poultry and eggs. Industrially important are smelting, metal-working and shoe-manufacturing plants. Orel was established as a fort on the Muscovite frontier in the middle of the 16th century; during the latter part of the 19th century it was a place of exile or imprisonment for political offenders. TURGENEV, the Russian novelist, was born here. Pop. 1926, 77,985.

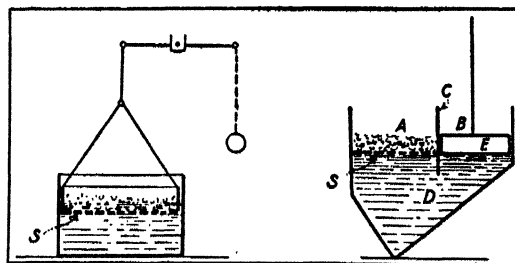
**ORENBURG**, administrative center of the Orenburg district in the Middle Volga Region of the R.S.F.S.R., on the Ural River. Through it passes the railroad line which terminates in Tashkent. Farming and cattle breeding are the chief occupations of the native provincial population, mainly Russian and Tatar. Orenburg is an export market for livestock, meat, hides and bristles, and for the metal goods which are manufactured here. The city has a large railroad shop. Considerable business with caravans from Asiatic Russia is maintained. Founded as a

fort in 1735 at a more easterly site, Orenburg was moved to its present location about 1743 to ward off invasions of Bashkirs and Kirghiz. In the 18th century it was the center of the Pugachev uprising. On the river's banks are the most noteworthy buildings, which include two 18th century cathedrals and the house of PUSHKIN during his sojourn in Orenburg. Pop. 1926, 123,283.

**ORESTES**, in Greek mythology, son of Agamemnon and Clytemnestra. He was brought up at Athens, but returned to Mycenae to avenge the death of his father who had been killed by Aegisthus, his mother's lover. Orestes slew the guilty pair and then fled to the temple at Delphi. He afterwards married HERMIONE, daughter of MENELAUS, having killed his rival Neoptolemus.

**ORE TREATMENT**, or milling, the processing of ORE to remove the valuable mineral. Ore as mined is metalliferous mineral more or less mixed with GANGUE, and it requires treatment for the extraction of the metals in a pure and marketable form.

With few exceptions, the ores mined are low grade, that is, they contain a large amount of gangue. Since the shipping and smelting costs of such ores are prohibitive, they are subjected to a treatment called ore concentration, or ore dressing, whereby they are reduced to a high-grade mineral of small bulk. The simplest method of concentration is SORTING. Only in a few cases will this alone suffice, and most ores are milled in machine-driven plants. Before concentration can be effected by other means than sorting, the valuable minerals have to be freed from the gangue with which they are intergrown. This is done by crushing, the ore being coarsely crushed in rock CRUSHERS and then ground finer in tube mills (*see GRINDING*). An intermediate crushing is often done by rolls. Screens are used to separate the ore into desired sizes. By this means, the recrushing of already sufficiently fine material is avoided. The portion which passes through the screen is called the "undersize," the one which remains on the screen is the "oversize."



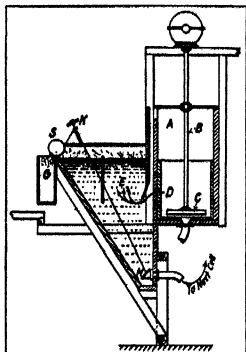
FROM T. SIMONS, ORE DRESSING, MCGRAW-HILL

#### JIGS

At left, sieve S, carrying ore and gangue, is "jigged" up and down in water. At right, plunger B pulsates water through a stationary sieve

In GRAVITY CONCENTRATION the differences in the specific gravities of the minerals is made use of with help of water. Coarse material is concentrated in jigs, finer material on concentrating tables. In Jigs,

a pulsating column of water separates the ore charged onto a screen into layers, the heavier particles which carry the values, sinking, and the lighter ones, which are mostly waste, going to the top. With concentrating tables, a jerking action conveys the heavy grains to one side, while the lighter particles are washed from

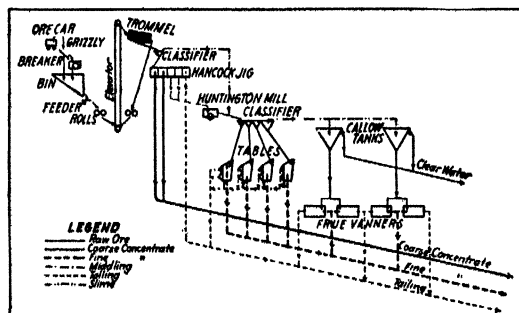


FROM T. SIMONS, ORE DRESSING, MCGRAW-HILL CO.

#### "MINERALS SEPARATION" FLOTATION MACHINE

In compartment A, the propeller C agitates the mixture and frothing "its" opening D the mixture passes into the flotation compartment E. The froth with its burden of sulphides rises and is scraped off by a revolving skimmer S into the launder, or trough G. The handle K operates a valve H through which the settled material passes to the next cell for repeated treatment

attach themselves to the frothy bubbles and float while the gangue sinks. MAGNETIC CONCENTRATION is used when an ore has some magnetic and some non-magnetic constituents. ELECTROSTATIC SEPARATION depends upon differences in electric conductivity between dif-



FROM T. SIMONS, ORE DRESSING, MCGRAW-HILL CO.

#### TYPE OF SIMPLE FLOW SHEET

Diagrammatic sketch of the passage of ore through various treatment processes

ferent minerals, but is rarely used. Where the ground ore and rock can be conveyed by gravity from one machine to another, it is washed along through troughs called launders. Otherwise, ELEVATORS are employed.

Some ores, such as oxidized copper ores are treated

by LEACHING methods. The CYANIDE PROCESS, used with gold and silver ores, is based on the solubility of these metals in a potassium or sodium cyanide solution. In AMALGAMATION, used in case of free milling gold ores, the ore is crushed by stamps, and the gold is extracted by virtue of its affinity for mercury. After the ores have been concentrated they are shipped to smelting and refining plants for final treatment. See also METALLURGY; MINING, METAL. B. L.

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**ORGAN**, a musical instrument of great antiquity in its primitive forms and of great complexity and power in its modern form. Sometimes known as the pipe-organ, to distinguish it from the pipeless reed-organ or melodeon, it has passed through numerous stages of elaboration in the last three centuries although its essential features, consisting of a set of pipes, a reservoir filled with air to operate them, and a series of levers, manual and pedal, to permit the air to flow from the reservoir into the pipes, have remained unaltered. Organs of previous centuries were tracker-action, the valves opening the pipes being operated directly by leverage. Owing to the tremendous tax thus placed upon the performer, tracker-



16TH CENTURY ORGA  
From Giovanni Bellini

action was supplanted by pneumatic action, which gave way to electric-action, making the touch of an organ as light as that of a piano. All modern organs are equipped with electric-action, and a number of old organs have been rebuilt with such action.

Outstanding features of the organ, more conveniently treated separately, are as follows:

**Pipes.** These are of wood or metal, ranging in length from 64 feet to a few inches. The longer pipes produce the lower tones; the shorter, the higher. Tone-quality is determined in part by the material of the pipe itself, and in certain instances by the presence of reeds.

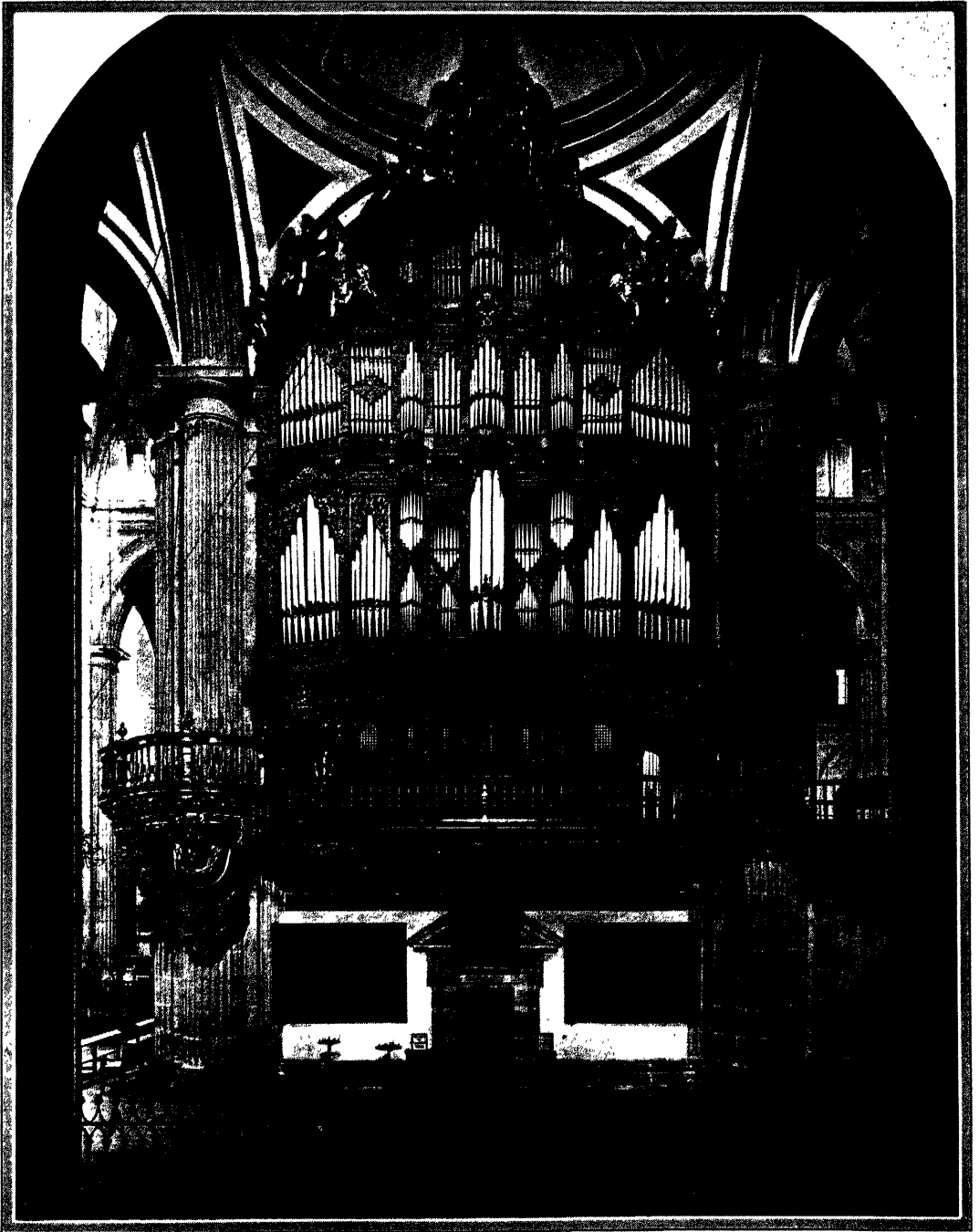


17TH CENTURY CHURCH  
ORGAN  
From an old German woodcut

**Console.** This is the movable desk containing the keyboards, manual and pedal. Within it are also contained the stops and couplers.

**Keyboards.** These are grouped in tiers. The lowest tier is named the choir-organ, the next the great-

## ORGAN

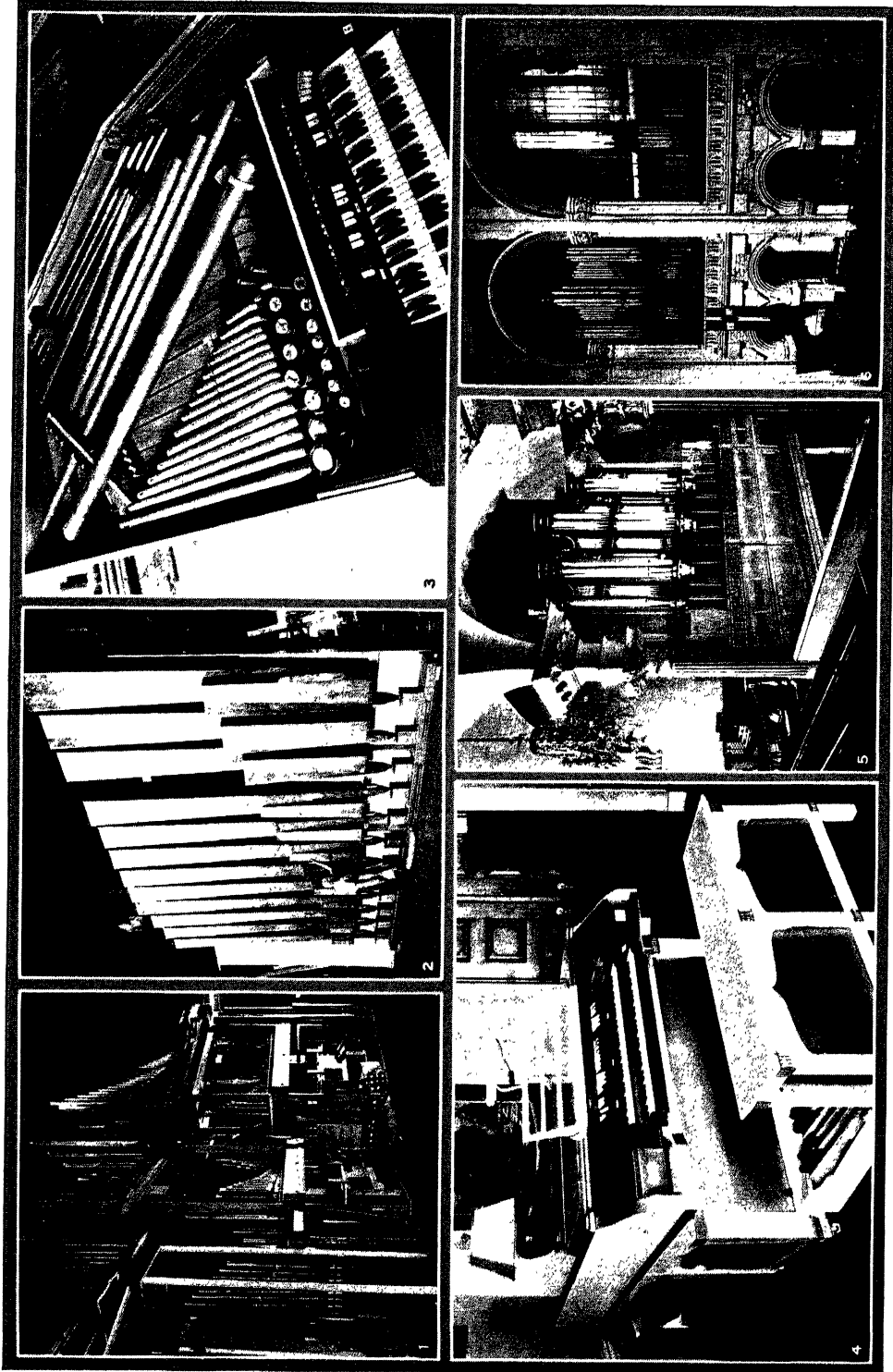


### ORGAN IN THE CATHEDRAL OF MEXICO CITY

One of the oldest organs on the North American continent. The pipes are arranged to harmonize with the architectural design of the cathedral, which was begun in 1573.



# ORGAN



1, 3, 4, COURTESY ESTEY ORGAN CO., NEW YORK; 2, 6, SKINNER ORGAN CO., NEW YORK; 5, WURTS BROS. PHOTO, COURTESY SKINNER ORGAN CO.

## MODERN ORGAN CONSTRUCTION

1. Division of the instrument in Pomona College, Claremont, California
2. 32-ft. bombarde (pedal stop).
3. Mitered pipes in a concert organ.
4. Organ with automatic reproducing mechanism.
5. Organ loft, St. Paul's Chapel, New York.
6. Division of organ, Cathedral of St. John the Divine.

organ, the next the swell-organ. If the organ has more than three manuals, the fourth tier is generally called the echo, and the tier above that the solo. By means of couplers, any pipe may be sounded from any keyboard, but in general only certain groups of pipes are operated from particular manuals.

**Stops.** These are draw-knobs or tilting tablets which control the connection between a given set of pipes and a given keyboard. When a given stop is pulled, all pipes of a given quality are automatically connected with a keyboard.

**Couplers.** These are similar to stops, except that they merely transfer the connection to different keyboards.

**Pedals.** These, operated by the feet, are similar to the conventional keyboard but much larger. The bass part of a composition is assigned almost exclusively to the pedals. In addition to the pedal keyboard should be mentioned the *swell pedal*, controlling the shutters in a box containing the swell organ, the *crescendo pedal* which, as it is depressed, successively connects more and more stops and the *sforzando pedal* which throws on the entire organ.

**ORGANIC EVOLUTION**, the process of change by which species or forms of animal or plant life have evolved from preexisting ones. Although to-day there are many distinct forms of life such as mammals, birds and reptiles, the fossilized skeletons of intermediate types are often found in the rocks. The chronological order in which these beds of rock were formed is often known with certainty and the rise and spread of many groups of animals and plants have been traced in detail. There can be no doubt as to the fact of evolution. The species of animals and plants living to-day have evolved gradually from species formerly living on the earth. There has, however, been some disagreement among competent investigators as to the methods and causes of evolution.

Recent research in the fields of genetics and cytology has shown that evolutionary change is produced chiefly if not entirely by either recombination of the hereditary factors, the genes, received from the parent germ cells on crossing; by profound changes in the chromosomes, the bearers of these genes; or by mutation of one or more individual genes. The genes are usually assumed to be chemical entities of about the same size as a protein molecule. There is evidence that the genes occur in linear order in the chromosomes, the most conspicuous part of the cell nucleus, and that each gene may influence many parts of the animal or plant. It is a matter of common observation that within a species no two individuals are exactly alike. While some of these differences may be due to environmental influences during development, many other differences are the result of genic change within the species. A certain ratio of gene combinations goes to make up a species. The Mendelian mechanism by which these genes are transmitted to the offspring insures the constancy of such ratios in large populations. There are, however, many

geographical and physiological opportunities for isolation of small groups within a species. Such isolated groups tend to evolve more rapidly than larger communities which are continually mixing their germ plasm.

Although some evolution may occur in an isolated community the new forms of life produced must eventually compete with other animals or plants for food, light or other necessities. Darwin realized that more individuals were produced than could possibly survive. He pointed out that those individuals would survive which chanced to be the better fitted to the particular habitat in which they found themselves. The environment would thus act as a sieve and in time a gradual improvement of each race would occur. This in brief is natural selection, a directing principle of evolution.

For many years naturalists have been impressed by the extraordinary adaptation of many animals and plants to their environment. It is known that many species undergo adaptive changes to meet certain conditions during their life and it has been assumed that these modifications can be handed on to the next generation. This Lamarckian principle of the inheritance of acquired characters has been tested by many investigators without confirmation. On the other hand recent experiments with X-ray and radium have shown that the genes and chromosomes may be permanently altered by irradiating the germ cells, while within the parent's body. It is possible that other external factors might induce hereditary changes in nature but all hereditary changes so far induced are nonadaptive. If these man-made variations were to survive in nature they would either have to be isolated from competition or go through the sieve of natural selection.

Darwinism is synonymous with natural selection although often incorrectly referred to as a theory that man came from monkeys. Recent discoveries of fossil men are tending to bridge the gap between the Miocene primates of India and the well-known Neanderthal and Cromagnon man. The discovery of very primitive human remains from the early Pleistocene of China has done much to show that the Java man, *Pithecanthropus*, may represent an early stage of human evolution which had a wide range in Asia. Man's relation to the primates rests, however, not only on the fossil evidence but on a wealth of anatomical and physiological evidence. During his development he passes through stages which are identical with those of primates and other mammals. In his body are many rudimentary structures, such as the ear-wagging muscles of no value to him but of use to ancestral types having these structures better developed. In brain, skeleton, viscera and many other features man shows a close resemblance to some of the anthropoid apes. As the fossil record shows this is due to the fact the anthropoids and man sprang from the same stock of primates. The fossil record of man is not as complete as that of the horse, elephant, camel or various other mammals, which hap-

pened to live in places where their bones could be easily fossilized. Important discoveries of fossil men are nevertheless being made with greater frequency than ever before and there is no reason to assume that the whole story will not be worked out before many years. In the meantime the truth of evolution is unassailable and has permeated all departments of science and human endeavor.

G. K. N.

**ORGANIZATION, INDUSTRIAL.** See INDUSTRIAL ORGANIZATION.

**ORGANIZED RESERVES.** Upon the passage of the National Defense Act in 1916 provision was made for the organized reserves to form a component part of the peacetime establishment of the Army of the United States. This force consists of both officers and enlisted men who can be called for a period of 15 days active duty training each year.

The personnel in the organized reserves are eligible for appointments to grades similar to those of the regular ARMY. The officer personnel is augmented each year from the young graduates of the Reserve Officers Training Corps units that are established at various universities and colleges throughout the United States.

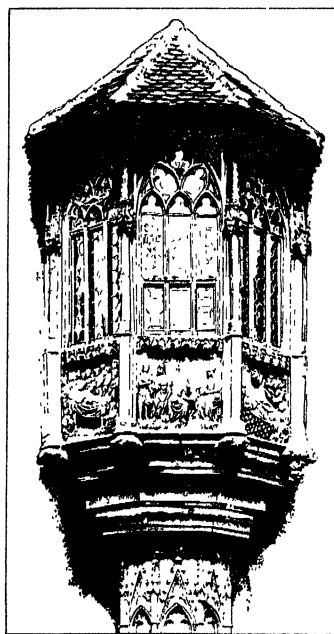
**ORGANO-METALLIC COMPOUNDS,** the name given in chemistry to such substances as consist of a combination of a metal with an organic radicle, such as methyl,  $\text{CH}_3$ , or ethyl,  $\text{C}_2\text{H}_5$ . The metals most common in this connection are magnesium, zinc, lead, tin, aluminum, and mercury, though sometimes the name is extended to include also the metalloids boron and silicon. One of the better known examples is zinc ethyl,  $\text{Zn}(\text{C}_2\text{H}_5)_2$ , produced by the reaction of metallic zinc upon ethyl iodide, which is a clear, colorless liquid with an unpleasant smell, and subject to spontaneous combustion in the presence of oxygen or air. Perhaps the best-known commercial representative is tetra-ethyl lead, of the "ethyl gasoline," used extensively as an improved motor fuel (see ANTI-KNOCK COMPOUNDS) since addition of even a minute quantity to the gasoline aids the combustion and stops the "knocking." It is a colorless liquid, highly poisonous, and made from lead chloride and zinc ethyl, or from ethyl chloride and an alloy of lead and sodium. In the compounds of multivalent metals one or more of the organic radicles may be replaced by a halogen or a hydroxyl group, thus producing such mixed substances as magnesium methyl bromide,  $\text{Mg} \cdot \text{CH}_3 \cdot \text{Br}$ , and trimethyl-lead hydroxide,  $\text{Pb} \cdot (\text{C}_2\text{H}_5)_3\text{OH}$ , which is a very strong base, comparable to potassium hydroxide. A peculiar property of these mixed compounds is their great chemical reactivity and the ease with which the several groups may be released or interchanged with others; for this reason they form very valuable and effective reagents in the laboratory synthesis of organic compounds (see also GRIGNARD'S REAGENT).

Salvarsan, or "606," the dihydro-chloride of dioxidiamino-arsenobenzene, Ehrlich's remedy for syphilis, is sometimes classed as an organo-metallic compound. See also CARBONYL COMPOUNDS.

W. J. L.

**ORGANON,** the writings of Aristotle on logic, which include the *Categories*, the *De Interpretatione*, the two *Analytics* and the *Topics*. It was regarded as an instrument of the analysis and guidance of thought as set over against both theoretical and practical philosophy. Bacon, in his reaction against the method of deduction, called his treatise the *Novum Organum* in order to distinguish it from Aristotle's *Organum*. Since his time there have been a number of other organons; but these two are the most important historically.

**ORIEL,** a window built out from the surface of a wall on bracket supports. An oriel is distinguished from a bay-window in that the latter rests upon ground foundations. Oriel windows were used in the



A RICHLY DECORATED ORIEL WINDOW IN THE CHURCH OF SAN SEBASTIAN, NUREMBERG, GERMANY

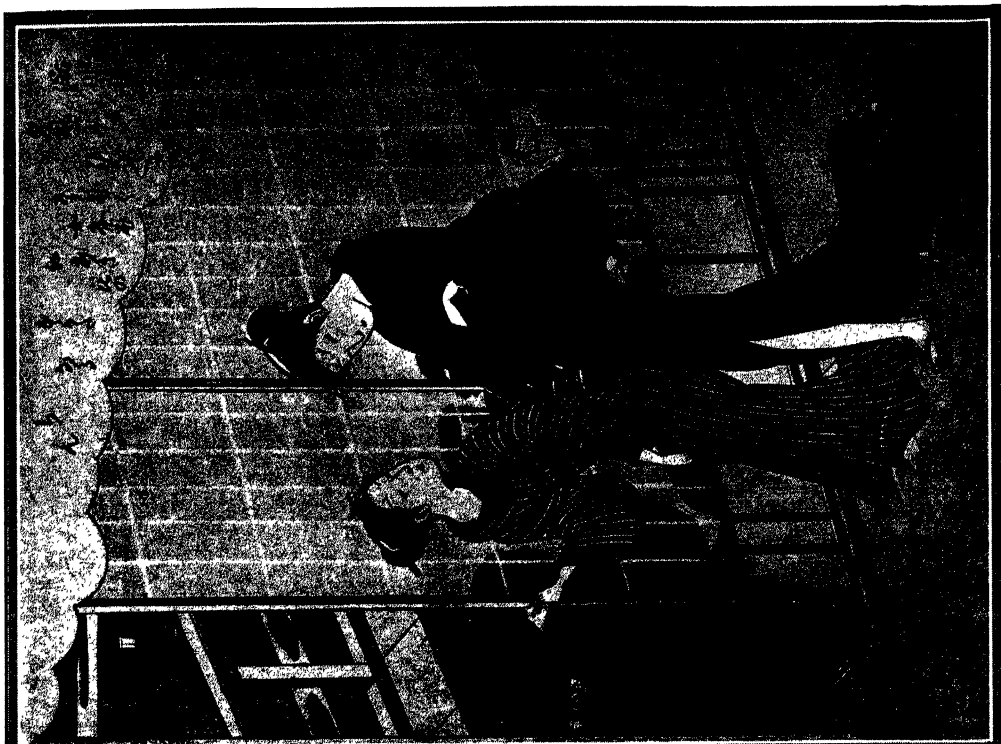
*Scenes from the life of the Virgin in relief are used for ornamentation*

upper stories of houses when safety still demanded that there be little breaking of the lower wall, and were later retained, although bay-windows had been introduced, in domestic and collegiate architecture.

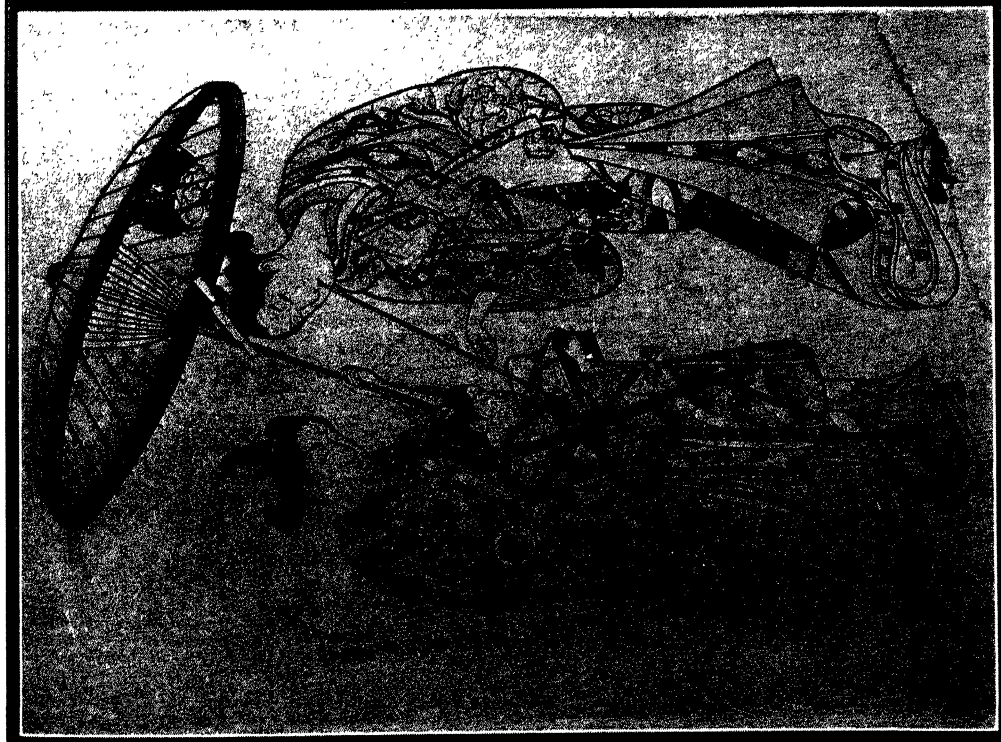
**ORIENT, THE,** another name for Asia generally and, more specifically, for southern and eastern Asia. The term comes to have this meaning from the fact that Asia lies to the east of Europe.

**ORIENTAL ART.** The countries of the East, whether in painting or sculpture, worked in a purely decorative way. The representation of nature to be found in the schools of Europe was gross and material to the Orientals to whom art was an instrument of religion and had a sacred and symbolical character (see CHINESE, JAPANESE AND INDIAN art). Buddhism,

# ORIENTAL ART



1. Scene from a play: Young man escorting a Yoshiwara beauty, by Okumura Masanobu (1690-1768).  
2. Women at a picnic, by Shiba Kokan (1747-1818).



COURTESY METROPOLITAN MUSEUM OF ART



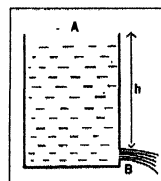
CHINESE VASES OF THE HAN DYNASTY

Both these dark pottery vases belong to the Han Dynasty (206 B.C.-A.D. 220) and were modeled in imitation of a bronze type. The decoration, executed by incised line, combines geometric patterns with stylized tiger forms.

teaching the mystery of the universe, contemplated in a serene way the loveliness of landscapes, clouds and flowers, not as they really were, but arranged, idealized, perfect in form. The deities likewise possessed an abstract quality for it was inconceivable to the eastern mind to show divinity with the stark realism of a crucifixion, for example, or an "entombment" by an Italian master. In architecture, the Chinese, Japanese and Indians built largely in wood, and gave little thought to the enduring qualities of their monuments, expressing again the Buddhist view that man's life is fleeting and only nature eternal. Like the Chinese, the Indians showed a Greek influence through the profusion of ornament in their architecture. The original Arabs, who set out to conquer the world in the name of the Prophet, were an in-artistic, nomadic tribe (*see* MOHAMMEDAN ART). They were willing to learn from the provinces they conquered and as a result Mohammedan art did not rise in one country, and is consequently a composite of a number of styles. It is more profusely ornamented than either the Chinese or Japanese. The most common design is the arabesque, devised in endless variety, and found in every corner of Islam. Chinese art declined when divorced from religion, but Mohammedan art, turning to worldly uses, flourished for centuries under the patronage of unorthodox caliphs. It was the cultured Japanese who introduced beauty into the most common objects of life. Japan, however, has jealously kept her treasures at home. The fact that so many of her finest prints are in Europe and the United States is explained by the indifference of the native connoisseurs to these masterpieces, an attitude inexplicable to western people. Turning to Byzantine art, it is significant that of all the schools of the East it alone was Christian. But like the others it was in the service of religion (*see* BYZANTINE ART). The fathers of the early church instructed artists to spread the gospel by means of painting, mosaic and carving. The work was under ecclesiastical supervision and in this manner many Christian symbols were first introduced into a school of art. Again, like other eastern schools, Byzantine art was decorative. Mosaic had been used for centuries in the East and in Rome, but under the Byzantines it attained a fullness and splendor of color unknown before. By the middle of the 6th century this branch of Byzantine culture had reached its apogee and some of its great murals had an influence lasting until the time of the RENAISSANCE. In Russia, in the portrayal of themes of a sacred character, Byzantium was dominant until comparatively recent times.

**ORIFICES, FLOW THROUGH.** The velocity with which a liquid will escape through a small opening in the side of a vessel was found experimentally by Torricelli to be expressed by the relation  $v^2 = 2gh$ . In this equation,  $h$  is the height of the liquid's surface above the opening in the side of the vessel,  $g$  the acceleration of gravity and  $v$  the velocity of the escaping liquid. This relation is true only when the opening is small as compared to the upper surface of the

liquid. This theorem may be demonstrated as follows: If no energy is lost in FRICTION or VISCOSITY, the energy of a mass escaping at  $B$  (*see figure*) must be the same as the energy of an equal mass at  $A$ . But since the potential energy at  $B$  due to gravity is less than at  $A$ , the kinetic energy at  $B$  must be correspondingly greater. If  $h$  is the height of  $A$  above  $B$ , there is a difference of the potential energy of a mass in between  $A$  and  $B$  equal to  $mgh$  ergs. The kinetic energy of a mass,  $m$ , escaping at  $B$  with a velocity,  $v$ , is  $\frac{1}{2}mv^2$ . The principle of the conservation of energy requires that  $mgh = \frac{1}{2}mv^2$ . Therefore,  $v = \sqrt{2gh}$ . This velocity is the same as that of a body falling freely from a height,  $h$ .



The density of the liquid and the direction of the jet do not affect the velocity. When the pressure alone is known, the height of the liquid required to produce the given pressure may be calculated and then used in the above formula. Thus, the pressure,  $p$ , at the level of  $B$  equals  $hdg$ ,  $d$  being the density of the liquid. Eliminating  $h$  in the above equation:

$$v = \sqrt{\frac{2p}{d}}$$

If  $a$  is the area of the opening at  $B$ ,  $av$  will not give the quantity of the liquid which passes  $B$  in unit time. This is due to what is called the *vena contracta*. The liquid, as it approaches the opening, moves in from all sides along stream-lines. Liquid coming from each side has a certain momentum toward the axis of the jet. This has a tendency to narrow the jet, and it does not become cylindrical until just after it leaves the orifice. A short cylindrical neck of the size of the opening will increase the amount of the liquid escaping per second; if the neck is somewhat flared, the flow will be still greater.

The velocity with which a gas escapes through a small opening when the difference of pressure between the two sides of the opening is  $p$ , may be found thus:

$$v = \sqrt{\frac{2p}{d}}$$

From this equation, the densities of gases may be compared by noting the times of escape of given quantities through a small opening, the pressure being maintained constant.

E. J. M.

**ORIGEN** (c. 185-c. 253), eminent Greek father of the Early Church, was born probably at Alexandria, Egypt, about 185. His father, Leonidas, was beheaded under Severus, 202, and the son was with difficulty prevented from sharing his father's martyrdom. Origen was educated in Alexandria and from 211 to 232 was head of a well-known catechetical school in that city. He was ordained in Caesarea; but after his return to Alexandria about 230, his enemies made charges against him, and, according to Photius, he was thereupon banished and deposed from the priesthood. He later founded a flourishing school at Caesarea in Syria, but in 250 he was imprisoned and tor-

tured almost to the point of death under the Decian persecution. After his release, he went to Tyre, where he died, about 253. His voluminous writings on the Holy Scriptures made him one of the greatest influences in the Early Church. His most valuable work is the *Hexapla*, an edition of the Old Testament.

**ORIGIN OF SPECIES, THE.** See DARWIN, CHARLES ROBERT.

**ORILLIA**, a town of Simcoe Co., and port of entry, Ontario, Canada, situated on Lake Simcoe, the Trent Valley Canal, and at the head of Lake Couchiching, about 86 mi. north of Toronto. Carrying on an active lake shipping trade in the grain, live stock and fruit produced in the district, it also has saw and grist mills, foundries and tanneries. Something of a summer resort because of its pleasant situation, Orillia has many public works and several educational institutions. Originally an Indian village, it was first settled by Europeans in 1836. Pop. 1921, 7,631; 1931, 8,183.

**ORINOCO**, a large river of South America. It rises in the Sierra del Parima, on the Brazil-Venezuela boundary, and after a course of 1,490 mi. flows into the Atlantic opposite the island of Trinidad.

The Orinoco, as far as its junction with the Guaviari has a northwest course, and 90 mi. before its union with that stream it receives its principal eastern affluent, the Ventuari. From the Guaviari, the Orinoco runs nearly due north as far as the Apure, where it suddenly takes an eastern course to the sea, receiving en route from the right the large rivers Caura and Caroni, the latter having a course of about 800 mi., of which 400 mi. are navigable. About 105 mi. from its source the Orinoco is connected with the Rio Negro by the Cassiquiari, a natural canal. Between the Guaviari and the Meta, the Orinoco is obstructed by the famous Maipures cataract, where, in several channels, it breaks through a granitic spur of the Guayana highlands for a length of about 4 mi. with a total fall of approximately 40 ft. After passing two minor reefs, the river reaches the Atures rapids, where it plunges through a succession of gorges for a distance of 6 mi., winding among confused masses of granite boulders and falling about 30 ft. It has free navigation for approximately 700 mi. up to the rapid of Cariben, within 6 mi. of the mouth of the Meta, where it is about 1 mi. wide. It gradually broadens as it continues north, until at the mouth of the Apure it is over 2 mi. wide in the dry season and about 7 in time of flood. At Cariben it rises 32 ft., but at Ciudad Bolívar, formerly Angostura, 373 mi. from the sea, the flood line reaches as high as 60 ft. above low river. Continuing its eastern course it enters the sea by its main trunk, the Boca Grande; but about 100 mi. above its mouth throws a great branch almost directly northward to the Gulf of Paria, a distance of 100 mi. From the vicinity of this bifurcation, six other arms find their way to the ocean across the vast triangular delta whose area is about 7,000 sq. mi.

The prevailing vegetation in the eastern half of the basin of the Orinoco consists of coarse grasses which become withered and sunburned during the dry sea-

son. In the great region traversed by the western tributaries there are extensive areas of brushwood, while in the valley of the upper Orinoco and on the eastern slopes of the Andes true tropical rain forests appear. Tropical rain forests also occur in the delta region but, near the sea are of the coastal type in which mangroves prevail.

The lowlands of the Orinoco basin remain largely isolated in spite of their nearness to the coast. Communication between them and the populous coastal belt is hindered not only by the parallel ranges of the Venezuelan Andes, but also by the difficulties of travel over the roadless plains, rendered all the more troublesome by their climatic conditions. During the rainy season when there is fodder for beasts of burden, floods are common and the routes become impassable.

**ORIOLE**, a name applied to two distinct groups of passerine birds, the Old World orioles (*Oriolidae*), somewhat allied to the crows, and the American orioles (*Icterus*), related to the bobolinks and grackles. The former group comprises 1. the typical orioles (*Oriolus*), embracing about 40 species of strictly arboreal birds with prevailingly yellow, olive-green and black plumage, found widely in Europe, Asia and Africa; 2. the fig-birds, including 6 species, confined to the Australian region. The most widely known is the golden oriole (*O. galbula*), golden-yellow with jet-black wings and tail, common in Europe and western Asia and wintering in South Africa.

The American orioles embrace some 50 species, with highly colored plumage and melodious song, mostly native to the tropics. They are strictly arboreal, feed mostly on insects injurious to agriculture and often weave remarkable hanging nests suspended from slender branches. Some 8 species occur in the United States; among these are the handsome Baltimore oriole (*Icterus galbula*), black above and reddish-orange below, of eastern North America; the orchard oriole (*I. spurius*), with a more southern range and with chestnut and black plumage, and the Bullock oriole (*I. bullocki*), brilliant orange and black with white wing patches, found in western North America.

A. B. J.

**ORION**, in Greek mythology, son of Hyrieus or Poseidon, was a giant hunter in Boeotia, who loved Merope, daughter of Oenopion of Chios. Because he did violence to her he was struck blind; but his sight was restored when he opened his eyes on the rising sun. There are other stories of his loves: according to one, Eos was enamored of him, to another, Artemis loved him and he died at her hands. The more usual legend is that he was killed by the bite of a scorpion.

**ORION** (gen. *Orionis*), easily the most magnificent constellation in the heavens and the glory of our winter skies. Situated on the celestial equator, it is visible all over the earth. In northern latitudes it is highest in the sky during early evenings in February. The ancients saw in this constellation the figure of a giant, the hunter Orion, whose body is formed by the four

stars, Alpha, Gamma, Beta and Kappa with Alpha Orionis, or BETELGEUSE, a red star of the first magnitude representing the shoulder or armpit and Beta Orionis, or RIGEL, a blue star of the first magnitude, the knee of the giant.

Gamma and Kappa Orionis are blue stars of the second magnitude, as are also Delta, Epsilon and Zeta, the three stars arranged in a straight line forming the belt of Orion. Underneath the belt are three much fainter stars in a line, known as the sword. The head of the giant is indicated by three stars above the body, while the shield is outlined by a dozen stars from the fourth to the sixth magnitude arranged in a curve situated to the east of the constellation. Many of the numerous bright stars in Orion are blue in color, mostly very distant and exceedingly brilliant, surpassing the sun from 100 to 2000 times in luminosity. Among them are a score or more double stars and SPECTROSCOPIC BINARIES.

The most interesting object in Orion is the Great Orion Nebula, visible to the naked eye as a hazy object of light surrounding Theta Orionis, the middle star of the sword. A telescope reveals a wealth of detail in the nebula, while long-exposure photographs show it pervading almost the entire constellation. It is a gaseous or diffuse nebula, emitting light of a greenish color. The star Theta Orionis, embedded in the densest portion of it, is shown in a large telescope to consist of six components. See STAR: map.

W. J. L.

**ORISKANY, BATTLE OF**, Aug. 6, 1777, an engagement of the REVOLUTIONARY WAR which resulted in an American victory. Ft. Stanwix on the New York frontier, garrisoned by 600 Continental troops, was menaced by the British force under Col. St. Leger of 1,700 regulars and Tories, with a band of Iroquois Indians led by JOSEPH BRANT. Nicholas Herkimer, a German resident of the vicinity, raised a force of 800 volunteers for the relief of the garrison. Herkimer's volunteers were entrapped in an ambush near Oriskany, eight miles from the fort. A terrific hand-to-hand contest ensued, with knives, bayonets and hatchets as weapons. Wounded in the leg, Herkimer propped himself against a tree and continued to direct the action. The Indians and British ultimately fled, about a third of the force on either side being killed or wounded.

**ORISSA**, a division of the province of BIHAR and Orissa of British India, situated east of the Bay of Bengal, with the Central Provinces on the west, Bengal on the north, and Godavari on the south. It comprises the alluvial delta of the rivers flowing into the sea and a hilly hinterland made up of feudatory states. Area 13,736 sq. mi. The temples of Orissa are more numerous than those of all India. The entire district is sacred ground, to which Hindus perform pilgrimages. Agriculture is carried on by an expensive means of irrigation. Orissa was conquered by the Great Mogul in 1568. The Mahrattas seized it in 1751, but they were forced to surrender it to the English in 1803. Until 1912 the division was

part of the Bengal presidency, when Orissa was formed with Bihar and Chota Nagpur into the province of Bihar and Orissa. Pop. 1921, 4,968,873; 1931, 5,300,398.

**ORIZABA**, a city in the state of Vera Cruz, Mexico, situated on the Orizaba River, at an elevation of over 4,000 ft. above sea level, about 80 mi. from the city of Vera Cruz. It lies in a valley famous for its beauty. It has extensive cigar manufactories, railway shops and a film studio. A fine beer, *Cerveza de Moctezuma*, is manufactured here. The city has a large market with an abundance of tropical fruits, flowers and vegetables. Numerous statues in the plaza are dedicated to Mexican heroes and statesmen. One of the oldest flour mills in America, operated by power from the Orizaba River, is in the city. Orizaba is a famous resort for residents of the hot country, and was a chosen retreat of the Emperor Maximilian and the Empress Carlota. Pop. 1930, 42,925.

**ORIZABA, PEAK OF**, an extinct or dormant volcanic mountain of Mexico, on the border line separating the states of Puebla and Vera Cruz. In Aztec its name is Citlaltepētl, meaning star mountain. With an elevation of 18,564 ft. it is the highest summit in Mexico and the third highest in North America. It rises from the southeast margin of the great Mexican plateau, forming one of the loveliest and most symmetrical cones in the world, and in clear weather is visible to ships for nearly 200 mi. The timber line reaches to about 13,500 ft. and the summit is snow covered but has no glaciers because of the dryness of the air and strong vertical rays of the sun. Its summit crater, elliptical in shape, measures 8,300 ft. across its longer axis and is 20,000 ft. in circumference. The volcano has been quiescent since 1856. It was first ascended in 1848 by Reynolds and Maynard.

**ORKNEY ISLANDS**, a group of 67 islands situated north of Scotland across the Pentland Firth. They were settled by the Norsemen and came under Scottish ownership as part of Margaret of Norway's dowry when she married James III of Scotland. To-day there is a mixture of Scandinavian and Scottish customs among the people, who number about 25,000. Only 29 of the islands are settled, the most important being Pomona. Cattle raising and fishing are the principal occupations, although barley, turnips, oats and potatoes are grown on the rocky land.

**ORLANDO**, a city in central Florida, the county seat of Orange Co., situated 150 mi. south of Jacksonville. Two railroads and bus lines serve the city. There also is an airport. The chief crops of this vicinity are citrus fruits and vegetables. Canning is the city's outstanding industry. The retail trade in 1929 amounted to \$16,576,271. Orlando is a most attractive winter resort. There are more than 1,000 lakes in the county. Rollins College is situated 4 mi. away, at Winter Park. Orlando was settled about 1850 and incorporated in 1875. Pop. 1920, 9,282; 1930, 27,330.

**ORLANDO, VITTORIO EMANUELE** (1860- ), Italian statesman, was born at Palermo,



Mar. 19, 1860. Educated for the law, he was deputy for Partinico, Sicily, in 1898, held various cabinet offices and in 1916 became Premier. He headed the Italian delegation at the conference in Paris after the war but was forced to resign when he could not obtain support for his Adriatic program. When Fascism rose in Italy, Orlando at first favoured it, but later changed his opinion and was forced to withdraw from the Italian Parliament.

**ORLANDO DI LASSO** (c. 1532-94), Netherlands music composer; *see* LASSO.

**ORLANDO FURIOSO**, an Italian epic in 46 cantos by ARIOSTO; first complete edition published 1532. Though a continuation of Boiardo's *Orlando Innamorato*, a somewhat earlier epic of Charlemagne's conquest of the Moors, this poem is concerned less with the title character, Orlando, than with Ruggiero, the mythical founder of the house of Este. The episode of Orlando's madness, brought about by his discovery that the beautiful pagan, Angelica, has disdained him and eloped with Medora, a young Moor, seems of minor importance beside the conversion of Ruggiero to Christianity, his marriage to Bradamant, the niece of Charlemagne, and finally his victory over Rodomont, the King of Algiers. Among English translations of the poem are those by Sir J. Harrington, 1591, J. Hoole, 1783, and W. S. Rose, 1823.

**ORLEANISTS**, supporters of the younger branch of the House of Bourbon, the princes of Orleans, who accepted the principles and flag of the Revolution and sought to reconcile them with monarchy. In the July Revolution of 1830 Louis-Philippe became "king by the grace of God and the will of the nation," but was himself overthrown in 1848. The cleavage between Legitimists and Orleanists in the early years of the Third Republic frustrated plans for the restoration of monarchy. To-day the Duc de Guise commands the support of both factions.

**ORLÉANS, CHARLES, DUC DE** (1391-1465), French feudal lord and poet, also known as Charles d'Orléans, was born May 26, 1391, the son of Louis, Duc d'Orléans. He became Duke of Orléans at 16, after his father's assassination, and was one of the most powerful noblemen in France. He was captured at the Battle of Agincourt (1415), and for 25 years was held for ransom in England. During this enforced leisure he wrote most of his poems, mainly rondels and ballads. His *Spring* and *Harbingers of Summer* are excellent examples of the rondel at its best. After 1440 Charles lived chiefly at Blois, keeping court and engaging in poetical tournaments with other poets of the day. He died at Amboise, Jan. 4, 1465.

**ORLÉANS**, a city situated on the Loire River in central France, capital of the department of Loiret. It has been prominent throughout the history of the country and is most notably associated with JOAN OF ARC. Entering the city on Apr. 29, 1429, Joan raised the siege on May 8. Ever since Orléans has celebrated that date as the festival of the national heroine. A cross marks the spot outside the walls where

Joan delivered her most crushing blow to the English, and the city has a Joan of Arc museum with a modern monument. Orléans was twice held by the Huguenots and suffered in the Massacre of St. Bartholomew. In 1870-71 it was twice taken by the Germans. The late Gothic cathedral has been restored at different periods. Modernized Orléans is an imposing city surrounded by boulevards; it has an active trade in wines and vinegar, and has varied industries. Pop. 1931, 71,606.

**ORLÉANS, HOUSE OF**, the name in French history of the younger branch of the reigning Bourbon and Valois families, dating from the 14th century. The Orléans princes held the duchy of Orléans as a royal grant. The outstanding holders of the title were Gaston Jean Baptiste (1608-60), the brother of Louis XIII of France, a conspirator against RICHELIEU, and Philippe (1640-1701), the brother of Louis XIV, in whom the house of Orléans-Bourbon originated. The latter branch furnished one king, LOUIS-PHILIPPE (1773-1850), whose supporters were known as ORLEANISTS. Under French Republican law, the Orléans princes may not reside in France.

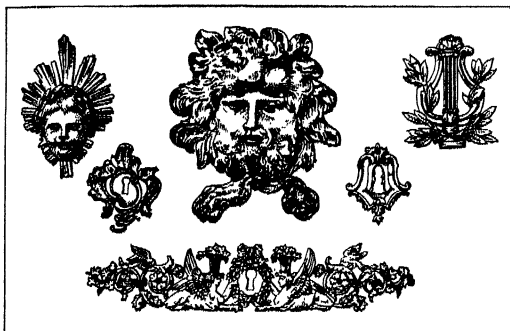
**ORLÉANS, SIEGE OF**. The English conquest of France, begun in 1417, reached its zenith in 1428 with the siege of Orléans. This was really an incomplete blockade by a series of surrounding forts. Events were turned to the French advantage by the appearance of Jeanne d'Arc by whose encouragement a French army brought relief and raised the siege in July, 1429. This marks the end of the English advance and the beginning of their retreat. It made possible the coronation of Charles VII at Rheims. Although it took more than 20 years of war to expel the English, this event is regarded as the military turning point of the Hundred Years War.

**ORM** or **ORMIN** (c. 1200), a religious, known by his metrical homilies on the Gospels, called *Ormulum*. He was probably a canon of St. Augustine's Priory at Elsham, near Lincoln, but there is little knowledge of his life. The *Ormulum* was written in iambic verse, in alternate lines of eight and seven syllables, without alliteration or rhyme. The 31 homilies still extant are in the Bodleian Library; it is clear from the table of contents there were originally 242. The existing 31 contain 20,000 lines. The dialect is Northern English, with some traces of Midland. The work is chiefly important for its examples of dialect.

**ORMOLU**, an alloy of copper, zinc and tin made to resemble gold. The effect is often heightened by burnishing, by a wash of gold lacquer or by the use of acids. The alloy is cast into the desired shape and the decorative design is then chiseled. Ormolu is used for candelabra, chandeliers and cheap jewelry; its chief use, however, is for furniture mountings, among which those made by the French *ébénistes* of the 18th century are the finest examples of ormolu. The term ormolu is also used to describe ground gold which is used for gilding bronzes, brass and copper.

**ORMULUM, THE**, an early English poem written by Orm or Ormin about 1200, consisting of a

series of homilies based chiefly on the New Testament. It is written in the midland dialect, though with certain northern features. The unique manuscript, in the Bodleian Library, Oxford, England,



COURTESY M. M. OF ART

EXAMPLES OF ORMOLU FROM FRENCH FURNITURE OF THE 18TH CENTURY

contains some 20,000 half lines, and is thought to represent about one-eighth of the entire original work. It is interesting to philologists because of the phonetic system used by the author, which marks short vowels by doubling the following consonant.

**ORMURI**, an Iranian language of the INDO-IRANIAN branch of the INDO-EUROPEAN linguistic family, spoken in two small areas in the Logar Valley and Waziristan in Afghanistan. It has no written literature, but is of linguistic interest as being related to the dialects of Western Persian and to KURDISH, as well as to DARDIC south of the Hindu Kush.

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**ORNITHOLOGY**, the science concerning birds, the vertebrate group that in degree of evolutionary development stands next to the mammals. Though considered frequently as occupied with studies dealing with descriptions of the various kinds of birds, their geographic distribution, and their manner of life, ornithology properly includes in its scope anything else dealing with the mechanism or activities of these creatures. As generally accepted this science is occupied principally with wild birds as distinguished from those kinds kept in domestication.

The modern study of ornithology is one of the most popular of the natural sciences, and has interested thousands of persons resident in all parts of the world. There are approximately 40 periodicals devoted entirely to the study of birds, and articles on the subject appear frequently in many magazines of general interest. Popular lectures in ornithology are in demand, and there is general and annually increasing attention to both its popular and scientific aspects.

As a basis for ornithological study museums of natural history have assembled large collections of specimens of birds, many of which are mounted in life-like attitudes, and are placed on public exhibition, often in groups arranged with a setting of vegetation

and a painted background that simulates the natural haunt of the species concerned. These form attractive features for the information of those who are interested in the subject in a general way. The greater part of museum collections of birds is kept in the form of study skins, which consist of the skin with feathers, bill, feet and wings removed intact from the body. The inside of the skin is poisoned, usually with arsenic, to prevent destruction by insects, and the whole is filled to proper size with cotton, tow or excelsior, so arranged, with the feathers smoothly in position, that the specimen resembles a dead bird. Each specimen bears a label on which there is given the place and date of capture, the sex and other useful information. Such study skins serve to show the external characters of the bill, feet, and other parts, and the colors that distinguish one kind of bird from another, and besides being easily handled and compared have the advantage of compact storage. It is on material of this kind that reports and handbooks for the identification of birds and other scientific studies are based.

The larger collections of bird skins, so far as possible, include series of specimens of each kind to illustrate differences between male and female, adult and young, seasonal changes and variations in color and size due to environment and geographic range. There are included also in some collections, such as those of the U.S. National Museum, series of birds preserved entire in alcohol for dissection, and sets of carefully cleaned skeletons. These furnish anatomical details of resemblances and differences through which are ascertained the relationships of the various birds and their proper arrangement in orderly classification. Collections of bird's eggs have received much attention and have been gathered both by museums and by private individuals. Through their relative ease in preservation, eggs furnish an attractive study for many persons, and many workers interested in systematic zoology have been attracted to serious scientific work through an early interest in oology.

The assemblage of all these collections involves constant search for material both locally and through expeditions that go far afield, at times involving considerable expenditures of money where there are important new facts to be secured. In general the exploratory phase of this work, through which large numbers of strange forms previously unknown to science may be discovered, is about at its close. The accumulation of further collections from almost all areas is, however, still of importance as there are many problems in geographic distribution and variation to be worked out through which many additional races will be distinguished and named. Further, it must be recognized that it is important to obtain as full representation as possible of existing birds, since modern progress in the utilization of land and water resources through the cutting down of forests, through agriculture and industrial developments, and through the general spread of civilized man over the earth, are steadily restricting the ranges available

to the less adaptable forms of birds. Many species have already become extinct and many more are near the point of extermination so that museum collections are becoming steadily more valuable historically. Unless specimens of birds are carefully preserved by this means they will be not only unknown to posterity but further researches in ornithology will be curtailed or at an end. Naturally in all this care should be used in collecting specimens of species of restricted range and known limited numbers in order not to bring them in danger of extermination.

An important part of ornithology concerns the study of live birds to ascertain their habits and distribution, their reaction and adaptation to environment, and similar matters that are of interest, such investigations being a popular pastime with hundreds of persons who delight in outdoor activities. By means of modern binocular field glasses it is possible to easily identify birds near at hand so that valuable observations are made in this manner. Motion and still photography are valuable adjuncts in this work and have been developed to a high point of efficiency, and records of sound in connection with motion pictures have been utilized for songs and other notes.

Conservation has become highly important in ornithology as esthetic interest in birds on the part of sympathetic persons has brought about organized protection against useless killing, particularly of birds economically valuable to man. There has also been regulation in hunting in order that stocks of game birds may not be depleted, though this has proved difficult due to increase in number of hunters, encroachment of other interests on the natural range of game birds, improved guns and ammunition, and the greater accessibility of hunting grounds. The importance of birds to the welfare and to the personal pleasure of man is now widely recognized. Conservation work is based on studies in economic ornithology which investigate the relation of birds to human interests in general in order to designate definitely those few species that may be injurious and may require restriction in numbers to avoid damage to man's interests. There are several organizations in the United States concerned actively with such work. The Federal Government participates in economic investigations and conservation through the work of laboratories and offices in the Bureau of Biological Survey of the U.S. Department of Agriculture, and local activity is carried on by state and private organizations.

Aviculture, where living birds are kept in confinement, is another valuable branch that is productive of pleasure to many and is a source of profit to those who breed various species for sale. The collections maintained by zoological parks are of distinct educational value in displaying birds in life, including many from foreign lands, for examination by the public. In certain modern laboratories living birds are used in experimental studies dealing with problems in evolution, physiology or biochemistry, whose scope is properly within that of other branches of science.

Graphic record in ornithology begins with paintings by men of the Ice Age, preserved in caverns in northern Spain, and with carvings in bone and ivory of the same period from various localities in western Europe, showing that birds were of interest to early types of man. The earliest written records in this science that have survived are the manuscripts of Aristotle (384-322 B.C.) which include reference to 170 kinds of birds. Aristotle was followed by Caius Plinius Secundus (A.D. 23-79), Liber X of his work being devoted to birds, while in the writings of Claudius Aelianus, born about A.D. 220, there is reference to several earlier naturalists whose writings have been lost. Various Mohammedan writers in the early periods of Moslem learning gave accounts of birds, beginning with Meuse, who died about A.D. 857. Avicenna (980-1037) is one of the best known of this group and Averroes, also called Ibn-Rushd, is reported the most learned. There still exist writings of a number of early Persian authors, and there is reference to birds in old Chinese dictionaries and encyclopaedias, knowledge of which is just becoming current among Western students.

With the invention of printing William Turner in 1544 published an account of the birds treated by Aristotle and Pliny, and in 1555 there appeared Conrad Gesner's *Historia Animalium*, with many original observations on birds. In the same year there was printed the *Histoire de la Nature des Oyseaux* by Pierre Belon. Linnaeus, a Swede, in 1735 began publication of a *Systema Naturæ* in which he attempted concise descriptions of all known plants and animals. In his tenth edition, printed in 1758, he adopted the scheme of designating each species by two Latin words, the first or generic name being applied to all closely related kinds, followed by a specific name that was used for one species alone in the generic group in question. This gave a convenient means of designating animals, including birds and plants that has continued to the present day, having been modified principally through modern employment of a third word to designate the geographic races that are separated as subspecies, these being distinguished from full species by use of a three term or trinomial system of naming.

The principal contributions to the science of ornithology, until after the beginning of the 19th century, were the work of European authors. Early writings were largely compilations from what had been said by other writers with a certain amount of new material added. Travelers returning from foreign lands brought stories of strange birds and their habits, often fanciful and distorted, supplemented in some cases by sketches, or by dried heads, feathers and other remains, and at times by living specimens. This was followed by development of various methods for the preservation of birds which led finally to the preparation of scientific specimens by the removal of the entire skin which was poisoned to prevent damage from insects. With actual specimens that could be preserved indefinitely there came the establishment

of permanent museums and private collections. Based on these steadily increasing gatherings of specimens writings in ornithology came to include detailed reports on collections of birds obtained by various exploring expeditions that were sent out through the world, and sumptuously illustrated monographs that treated of various groups and families. Certain French dictionaries which were encyclopaedic in form, included accounts of various kinds of birds, and covered accounts of all birds known to the writers. The monographs of John Gould, beginning in 1832 and continuing for 40 years, covered several dozen large folio works containing more than 3,000 plates. There may be mentioned also the writings of Audubon on the *Birds of America* in four large volumes, published between 1827 and 1838, and his *Ornithological Biography*, as important early treatises on the birds of North America.

In 1874 R. Bowdler Sharpe, of the British Museum, began a *Catalogue of Birds in the British Museum*, which was in fact a descriptive account of the birds of the world, and with assistance from other authors was finally completed in 1898 in 27 volumes. Sharpe subsequently prepared a *Hand List of the Birds of the World* in five volumes printed from 1899 to 1909.

Work by Americans in ornithology centered first mainly in Philadelphia in the Academy of Natural Sciences. In 1850 Spencer Fullerton Baird, first assistant secretary of the Smithsonian Institution, began development of work in systematic zoology in Washington that included many contributions on birds by Baird and his associates, and led to work on a comprehensive account of the birds of the Americas, begun by Baird and then finally undertaken by Robert Ridgway, who published 8 volumes on the *Birds of North and Middle America* as Bulletin 50 of the U.S. National Museum between 1901 and 1919, and left two further volumes partly completed on his death in 1929. In 1931 there appeared the first volume of J. L. Peters's *Birds of the World* to include a list of the known living avifauna.

Besides modern progress in America, where activity in ornithology has now equalled that of Europe, there has been much work in Japan, the Philippines, the Malay region, Australia, Africa and South America, without taking into account the elaborate investigations published on the birds of these countries by American and European authors. Some clue to the vast literature now available on birds may be obtained from examining the collections of large libraries, from the *Introduction to the Literature of Vertebrate Zoology*, by Casey Wood published in 1931, or from examining reviews in current files of the *Auk*, and the *Ibis*, periodicals published quarterly by the American Ornithologists' Union and the British Ornithologists' Union respectively. The science is now pursued professionally by a large number of workers.

A. W. E.

**OROVILLE**, a city in northern California, the county seat of Butte Co. Oroville lies at the base of the Sierra Nevada Mountains where the Feather

River comes out of the canyon to the open valley. The city is 78 mi. north of Sacramento and is served by three railroads. Navel oranges and olives are the chief crops of this vicinity, and lumber products manufacture is the chief local industry. Oroville was the scene of the second gold discovery of California and contains a museum of early California history. The city was first settled in 1849 as Ophir. Later the name was changed to Oroville and incorporated in 1856. Pop. 1920, 3,340; 1930, 3,698.

**ORPEN, SIR WILLIAM NEWENHAM MONTAGUE** (1878-1931), British painter and author, was born at Oriel, near Dublin, Ireland, Nov. 27, 1878. He received his scholastic and art training in Dublin Metropolitan School of Art and Slade School, London. Orpen painted portraits magnificently and his works are distinguished for their interesting silhouette and design, skillful handling of accessories and arresting character portrayal. In 1918, he held a Great Exhibition of War Pictures, after which he presented many of the paintings to Great Britain. Among his notable canvasses are "The Dead Ptarmigan," 1909, a self-portrait in the possession of Col. Poë, "Myself and Venus," 1910, Carnegie Institute, Pittsburgh, "Leading the Life in the West," 1914, Metropolitan Museum, New York, and "Signing of the Peace Treaty at Versailles," 1920, Imperial War Museum, London. He is the author of *An Onlooker in France*, 1921, *Stories of Old Ireland and Myself*, 1924, and four books of art studies that were collected in *The Outline of Art*, 1931. Orpen died at London, Sept. 30, 1931.

**ORPHANAGES**, a term commonly applied to all institutions caring for destitute children. The number in the United States was small in the early 19th century and increased slowly until the Civil War period, when there came a tremendous growth following the enactment of laws forbidding the care of children in almshouses. Since the rise of the foster home movement in the later 19th century orphanages have been increasingly used for children who for various reasons cannot be placed in family homes. In its main outlines their history has followed much the same course in England.

Orphanages are of two types, i.e., the congregate in which one large building houses the children and contains all the services provided for their care; and the cottage plan, in which the children live in small groups of from 10 to 25. There were in 1931 approximately 1,500 orphanages in the United States.

F. T.

**BIBLIOGRAPHY.**—Homer Folks, *The Care of Destitute, Neglected, and Delinquent Children*, 1911; H. W. Thurston, *The Dependent Child*, 1930.

**ORPHEUS**, in Greek mythology, son of Oeagrus and Calliope. (See *MUSES*.) He played so exquisitely on his lyre that even the rivers and forests gave heed to him. When his wife, Eurydice, died, Orpheus, charming Pluto by his music, obtained this king's consent to her return to earth on one condition, that Orpheus would not look back until they had left

Hades. When almost out, he turned to see if Eurydice were following, whereupon she vanished from his sight. Retiring to the caves of his native Thrace, he would accept no other bride. This so angered the Thracian women that in a Dionysiac orgy they tore him to pieces and threw his head into the Hebrus. The Muses, collecting his remains, buried them at the foot of Olympus. Zeus placed Orpheus's lyre among the stars.

**ORPHEUS AND EURYDICE**, an opera in three acts by C. W. von GLUCK, libretto by Raniero di Calzabigi; première, Vienna, 1762, Paris, 1774, London, 1860, New York, 1885. Indebted though Gluck was to Monteverde (whose own opera *Orfeo* had been produced 150 years earlier, virtually founding the art of opera), Gluck's contribution is second only in importance to that of his distinguished predecessor. It thus boasts a peculiar importance in musical history.

Orpheus, mythological singer and musician, is grief-stricken over the death of his wife, Eurydice. Eros, the god of love, promises to take Orpheus to her, where she dwells in Hades. If he is able, by the magic of his music, to placate Pluto and thus wrest Eurydice from his dominion over her, he may do so, but under no circumstance is he to look at Eurydice until they have safely passed the Styx. Overjoyed, Orpheus departs, charming with his song the demons who guard the entrance to Hades. Eventually they are persuaded to bring him Eurydice. He takes her hand in ecstasy but carefully looks away as he is bidden. Then, walking ahead, he urges her impetuously to follow. Still he does not look around, and his failure to do so is interpreted by Eurydice as indifference. Protesting that rather would she die than have lost his love, she so affects Orpheus that he weakens. He turns, and at the same moment she dies in the arms that embrace her. Touched by the love which Orpheus has exhibited, Eros relents and restores Eurydice to life.

**ORPIMENT**, a beautiful yellow mineral, a sulphide of arsenic. It contains less arsenic than REALGAR, another arsenic sulphide. The two occur together in veins with silver and lead ores, and in hot spring deposits.

It is used as a pigment, in dyeing, and in preparations for removing hair from skins. The commercial supply comes mostly from artificially prepared orpiment. It is found in Hungary, Utah, Nevada and in Yellowstone Park. See also ORE DEPOSITS; VULCANISM; ORE.

**ORTEGA Y GASSET, JOSÉ** (1883- ), Spanish writer, was born at Madrid, May 9, 1883. He is noted for having introduced modern scientific methods of study into Spain. His best known work, *Meditaciones del Quijote*, demonstrate his pre-eminence as a leader of culture in Spain.

**ORTHOCLASE**, a rock-forming mineral of considerable importance, especially in the IGNEOUS ROCKS. It is a light-colored FELDSPAR, consisting of a potassium-aluminium silicate which crystallizes in the MONOCLINIC SYSTEM. A green variety which crystal-

lizes in the TRICLINIC SYSTEM is known as MICROCLINE. Clear varieties of orthoclase are sometimes cut for GEM STONES and are known as MOONSTONE. See also MINERALOGY; PETROLOGY.

**ORTHOGENESIS**, the evolution of animals or plants in a definite direction. It has been assumed to be due to the mutation of the genes or hereditary factors being restricted to certain progressive or regressive lines of change. The zoologist Eimer and the botanist Nägeli were among the early advocates of this view. Modern genetics provides some evidence of restricted mutation but the fact of orthogenesis, clearly seen in the evolution of the elephant, rhinoceros and many other mammals is usually accounted for by natural selection favoring certain lines. Thus the titanotheres increased rapidly in size during the early part of the age of mammals. They had horns which grew at a definite rate. The larger titanotheres presumably grew for a longer period and hence would have bigger horns than the smaller species. If natural selection favored large size it would favor large horns whether or not these had any use in the struggle for existence. See ORGANIC EVOLUTION. G. K. N.

**ORTHOPEDIC SURGERY**, the science of the prevention and correction of deformity and the preservation and restoration of the function or usefulness of the motor apparatus of the body, including the use of the bones, joints, muscles, tendons and the blood vessels and nerves of the neck, back and limbs.

The important structures or tissues which concern the orthopedic surgeon are: the bones, joints, capsules, synovial membranes, muscles, tendons, ligaments, fasciae, bursae, and blood vessels and nerves of the limbs.

It is desirable that all classes of people be informed of the importance of the *prevention* of orthopedic deformities and disabilities by requesting early consultation in those diseases which may, or usually do, result in deformities. This is especially true in infantile paralysis, congenital deformities, arthritis, foot disturbances and postural conditions.

It is said that the followers of Aesculapius built an open air temple of healing in honor of their master. This was the forerunner of the treatment by the sun, or heliotherapy. Hippocrates, who lived in 400 B.C., practiced orthopedic surgery in the treatment of fractures, congenital dislocation of the hip and club-foot.

There was a period when orthopedic surgery included a comparatively small group of conditions, such as lateral curvature of the spine or scoliosis, flat foot, deformities due to rickets and club-foot. All orthopedic conditions were then treated by manipulation or forcible correction. About 1832, the operation of cutting a tendon came into use. Then an occasional purposeful fracture of a bone or osteotomy was performed. One should contrast this situation with the present, where some of the most technical operations are included in orthopedic surgery.

Orthopedic surgery was given a great and important impetus during the World War, especially in

the treatment of fractures and wounds. The war produced a marvelous psychological change in the attitude of the cripple as a patient and the world toward deformity and disability. It also taught the important lesson, of the psychological and physical value of occupational therapy or directed work, which resulted in the establishment of curative workshops. For example, a man was given a screw driver in order to stimulate turning movements of the forearm and a saw to exercise his shoulder.

Fresh air and sunlight form an essential basis for treatment.

It is interesting to note the remarkable change in the type of cases most commonly observed by the orthopedic surgeon. Infantile paralysis has quickly deposed tuberculosis from its leading position.

The most important events affecting orthopedic conditions in the last four decades include the following: New diagnostic methods, including X-ray, discovered in 1895, with refinements in technique, such as the Bucky-Potter diaphragm and Coolidge tube; the Lister discovery of antiseptics which made open operations safe; the War which advanced knowledge of fractures, osteomyelitis, and wounds of the soft tissues; nutritional studies of rickets, scurvy and other conditions; anesthesia which allowed various kinds of prolonged operations and abolished pain and muscle spasm; electric-driven operating instruments; special tables for the reduction and retention of fractures; Koch's discovery of the tubercle bacilli, the cause of tuberculosis; improved technique in the use of plaster-of-Paris for splints and casts; public health nurses, including visiting nurses and tuberculosis nurses; clean food, milk and water especially; the treatment of osteomyelitis by the vaseline pack and plaster cast of Orr and the living scavenger (maggot) method of Baer; physical therapy, especially radiant heat, massage, diathermy and ultraviolet light; heliotherapy and its various lamp substitutes; occupational therapy; immediate measures to prevent contractures and deformities; the rehabilitation programs carried out by various countries during and after the last war.

There is considerable discussion as to what is included in orthopedic surgery. The answer to this was given by Sir Robert Jones during the War when he decided that orthopedic surgery included: (1) recent, badly united and ununited fractures; (2) deformities of the extremities and spine; (3) diseases, derangements and disabilities of the joints including the spine; (4) injury to the nerves of the limbs.

In a few countries, orthopedic surgeons confine their specialty to children.

The important conditions included in orthopedic surgery are the following: diseases such as tuberculosis of bones and osteomyelitis; deformities, such as bowlegs, knock-knees, flatfoot and round shoulders; disabilities such as muscle weakness and disturbances of muscle and nerve coordination; nutritional disturbances, such as rickets and scurvy; congenital deformities, illustrated by the child born with dislocation of one or both hips, club-foot and curvature of the spine;

traumatic conditions, including fractures, dislocations and injuries to muscles and nerves; infectious diseases, including infantile paralysis, arthritis, tuberculosis and many others; tumors, including those occurring in bones and soft tissues.

Of the above conditions, the most important include infantile paralysis, tuberculosis, arthritis, congenital dislocation of the hip, club-foot, rickets, disturbances of the epiphyses or growth centers of bones and circulatory conditions.

In spite of the fact that orthopedic surgery is a highly specialized branch of medicine and surgery, it is very closely related to all branches, especially roentgenology, neurology, genito-urinary surgery, gynecology and the specialties of throat, nose and ear.

Prevention of deformity is usually possible without interfering with the routine treatment of the original condition. If not prevented, deformity must be corrected as soon as possible. It is much easier to preserve the usefulness of a member than it is to restore it when lost.

According to Sir Robert Jones, two diseases, tuberculosis and rickets, are responsible for about half of the cripples. Rickets is entirely preventable. There are enough data available concerning tuberculosis to be able to predict that within a generation it could be stamped out if concerted action were taken. Unclean milk and personal contact are the individual's worst enemies and the objective must be to conquer them. See also SPINAL COLUMN, SURGERY OF.

P. L.

BIBLIOGRAPHY.—Sir Arthur Keith, *Menders of the Maimed*, Oxford Medical Publications, 1919; Sir Robert Jones, *Lancet*, Jan., 1931.

**ORTHOPTERA**, the scientific name for an order of insects, which includes grasshoppers, crickets, locusts, cockroaches, mantis and stick and leaf insects. Members of this order usually have leathery forewings and membranous hind-wings which fold up like fans, though some are wingless. There are over 13,000 species distributed almost over the entire world. Most of them are adapted for running on the ground and many can make long leaps. Forms like the praying mantis and the walking sticks are at home on trees and bushes. These insects are generally quite large; some are several inches long, and the largest stick insects measure about 13 in. Many orthoptera are capable of producing sounds by rubbing a row of pegs on their hind legs against a special hard area of their forewings. A. I. W.

**ORTHORHOMBIC SYSTEM**, in CRYSTALLOGRAPHY, a system in which minerals are said to crystallize when their faces can conveniently be described by referring them to three imaginary axes of unequal length, intersecting at right angles at the center of the crystal.

**ORTIZ RUBIO, PASCUAL** (1877- ), President of Mexico, was born in Morelia, state of Michoacan, in 1877. He was educated at the National University, practiced engineering and served as an officer in the Mexican Army. He joined the revolutionists

and, while imprisoned by his enemies, wrote books that have since become text-books. He was promoted to captain in 1911 and to brigadier general in 1920. After a secret mission to New York in 1916, he was appointed governor of Michoacan. He became Mexican minister to Germany in 1923, and was recalled to take the post of ambassador to Brazil. He was elected President of Mexico in Nov. 1929. On his return from the inauguration exercises in Feb. 1930, Ortiz Rubio and his wife were shot by an assassin, but both recovered.

**ORTOLAN**, an Old World species of bunting (*Emberiza hortulana*), a small bird of the finch family, highly esteemed for its delicate flesh. It is found widely in Europe and western Asia in summer, migrating to northern Africa in winter. The ortolan is about 6 in. long with mostly brownish, yellow and chestnut plumage. Living in open fields, it feeds upon seeds and insects, and nests on the ground, laying 4 to 6 spotted pale gray eggs. In southern Europe ortolans are netted alive in the autumn, fattened in confinement upon grain, and marketed in immense numbers for the table.

**ORURO**, a city of Bolivia, situated about 140 mi. southeast of La Paz, at an elevation of 12,153 ft. The mean temperature during the day is 42° F., but the nights are colder. Because of its position as a railway center, Oruro is the most active city of the country. Mining is the chief industry of the surrounding region, and minerals valued in millions are exported annually. The entire territory is covered with saline deposits. Oruro has good business houses, a public library, an important school of mines, a museum of minerals and several theaters. Pop. 1930, 41,410.

**ORVIETO**, a city in the province of Perugia in central Italy. It is the seat of a bishop. The cathedral, with its exterior of black basalt and greyish yellow limestone, is one of the finest examples of Italian Gothic, and was begun before 1285 and finished in 1309. The façade is richly adorned and has been called "the greatest monument in polychrome in the world." The cathedral possesses some of the finest work of FRA ANGELICO, Simone Mosca, and Luca Signorelli. Adjoining the cathedral is the former Papal Palace, now a museum containing paintings, sculptures and Etruscan antiquities. There are other fine churches, palaces, and monasteries here. The Etruscan Necropolis is near by, with tombs chiefly of the 5th century B.C. The city was the ancient town of *Volsinii*, later known as *Urbs Vetus*. In the Middle Ages Orvieto was a stronghold of the Guelphs and often a refuge of the Popes. Pop. 1931, 20,352.

**ORYX**, a name applied to a group of African antelopes inhabiting desert regions. The true or typical oryx is the beisa (*Oryx beisa*) of eastern and north-eastern Africa, especially Abyssinia. The north African representative of the group is *O. leucoryx*. They are all large animals with long tufted tails and long horns which are present in both sexes. The horns of the beisa, about 3 ft. long, project almost

straight backward with little spread and are ringed at the base. With these powerful weapons of defense a wounded animal is dangerous to approach.

**OSAGE**, an important southern Siouan tribe which lived in southern Missouri, northern Arkansas and northeastern Oklahoma. Originally they are supposed to have constituted a single body with the Omaha, Ponca, Kansa and Quapaw along the lower course of the Ohio River. They were constantly at war with their neighbors and during Colonial times aided the French against other tribes. Beginning in 1808 they gradually ceded their extensive territory to the United States but on such advantageous terms that they became the wealthiest American tribe per capita. The Osage Indians have attained much additional wealth through the discovery of oil on their reservations.

**OSAGE ORANGE** (*Maclura pomifera*), a medium-sized, spiny tree of the mulberry family called also bow wood, extensively planted for hedges. It is native to rich soils from southern Arkansas through southeastern Oklahoma to southern Texas, and widely distributed elsewhere in the eastern and southern states by cultivation. The tree grows 50 to 60 ft. high with a short trunk and stout erect branches bearing oblong, pointed, glossy-green leaves, inconspicuous flowers and a large, yellow, somewhat orange-like fruit, 4 or 5 in. in diameter. Not only the bark and leaves, but also the fruits contain a thick milky juice. The very strong, flexible, dark-yellow wood was formerly used by the Osage and other Indians for bows and war clubs.

**OSAGE RIVER**, a stream of Kansas and Missouri, rising in eastern Kansas about 30 mi. southwest of Topeka. By a southeasterly course it enters Missouri where it turns northeast and empties into the Missouri River about 9 mi. below Jefferson City. The portion in Kansas and western Missouri was formerly called the Marais des Cygnes. This river, fed entirely by rainfall, drops less than 1 ft. per mi. for three-fourths of its length. Its drainage basin of 15,300 sq. mi. consists of fertile agricultural lands. In Missouri the river winds in great curves which are deeply incised. Counting these windings the stream measures about 500 mi.

**OSAKA**, a manufacturing, seacoast city of Japan, and the largest industrial and commercial center in the Orient. It is situated in the southwestern part of Honshu Island and is built on the River Yodo. Covering a larger area than any other city in Japan, Osaka extends along numerous picturesque canals which are used for commerce. Among the modern features of the port are a central market, motor traffic, tramways, harbor works and large shops. Hundreds of towering factories contrast with the roofs of castles and temples of the Middle Ages. One of the famous streets of the city is Dotombi, lined with theaters of the traditional Japanese plays, which maintain the classic styles and formulas of the ancient drama. The chief industries are in cotton, dry goods, silks and curios. Trains as well as the natural and artificial



waterways carry exports from the city. Among the historical places of interest in Osaka are the castle, built by Toyotomi Hideyoshi, and present quarters of the fourth division of the army, and Tennoji Temple, celebrated for its five-storied pagoda. The Imperial Mint, landscaped among cherry trees, testifies to Osaka's financial importance, and is also a tourists' visiting spot. In the vicinity of the city are Sumiyoshi Shrine, hemmed in by tall pines, Mino Park and Hamadera Park, a popular Japanese play center on Osaka's white, sandy beach. Resorts include Takarazuka with its mineral waters, and Arima Hot Springs. The latter is famous in Japanese history for its efficacy in restoring youth and vigor to the old and debilitated. Osaka is the largest city of Japan in the number of its inhabitants. Pop. 1930, 2,453,573.

**OSAWATOMIE**, a town in Miami Co., eastern Kansas, situated 45 mi. southwest of Kansas City. It is served by the Missouri Pacific Railroad. There are gas and oil fields in the vicinity; farming and stock raising are important interests. The town has an oil refinery, railroad shops and a candy factory. Osawatomie was founded in 1854. Prior to the Civil War, the community was divided into pro-slavery and free-soil advocates. On August 30, 1856, John Brown with a small group of adherents met Gen. John W. Reid and 400 men in a skirmish in which Brown was soon overpowered, and the town devastated and burned. Pop. 1920, 3,293; 1930, 4,440.

**OSBORN, HENRY FAIRFIELD** (1857- ), American palaeontologist, was born at Fairfield, Conn., Aug. 8, 1857. From 1881 to 1883 he was professor of anatomy at Princeton. In 1891 he became professor of biology at Columbia University, and in 1896 professor of zoology. He became curator of the department of vertebrate palaeontology of the American Museum of Natural History in 1891, later Vice-President, and in 1908 President. In 1900 he became palaeontologist of the U.S. Geological Survey. Osborn made numerous scientific expeditions gathering valuable scientific data and built up the Museum, particularly its collections and exhibits showing the development of the higher vertebrates. He founded a school of vertebrate palaeontology at the Museum which had a powerful influence upon American zoological teaching. He wrote voluminously upon a wide range of biological and geological questions. A list of titles appears in the Museum's publication, *A Bibliography of the Writings of Henry Fairfield Osborn*, 1927.

**OSCAR I** (1799-1859), King of Sweden and Norway, son of CHARLES XIV of Sweden, was born in Paris in 1799. He ascended the throne at the death of his father in 1844, and although favoring the most conservative of political policies, he was instrumental in introducing measures leading to the material and economic improvement of his realm. In 1855 Oscar negotiated a treaty with Great Britain and France guarantying the territorial integrity of Scandinavia. Oscar died in Sweden in 1859 and was succeeded by his son CHARLES XV.

**OSCAR II** (1829-1907), the last King of united Sweden and Norway, was born at Stockholm, Jan. 21, 1829. He was the third son of Oscar I. and succeeded his brother Charles XV in 1872. Oscar was educated at Uppsala and at the Naval Academy. He was actively interested in naval matters and wrote several books on the subject. His literary output was considerable and included historical works and poetry. During his reign occurred the separation of Norway and Sweden, the crown of Norway being given to Prince Carl of Denmark as Haakon VII. The loss of Norway was a great blow to Oscar and probably hastened his death. He died at Stockholm, Dec. 8, 1907.

**OSCILLATOR, ELECTRIC**, a device for producing electric oscillations of any desired FREQUENCY in an electric circuit. A displacement of ELECTRONS toward one side of an open circuit produces a difference of potential between the two sides of the circuit. When the displacing force is removed, the electrons are accelerated toward their normal position and acquire kinetic ENERGY which carries them beyond that position. The electrons then oscillate until all their energy is converted into HEAT and into the energy of ELECTROMAGNETIC WAVES.

The frequency of the oscillations depends on the electrical constants of the circuit, the time of one complete oscillation being

$$t = \frac{2\pi LC}{\sqrt{LC - \frac{1}{4}R^2C^2}} \text{ sec.},$$

where  $L$ ,  $C$  and  $R$  are self-inductance (*see* INDUCTANCE), CAPACITANCE and RESISTANCE respectively.

When the resistance is negligible, as is often the case,

$$t = 2\pi\sqrt{LC}.$$

The electrons oscillate only when

$$R < \sqrt{\frac{4L}{C}}.$$

Fig. 1 shows how such oscillations, which also apply to the discharge of a CONDENSER, diminish in amplitude without any change in frequency.

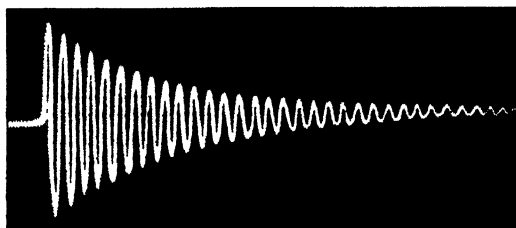


FIG. 1. OSCILLOGRAM OF A DAMPED OSCILLATORY DISCHARGE OF A CONDENSER

The Hertz oscillator is an open-circuit oscillator and consists of two metal plates connected as shown in Fig. 2. When the plates discharge through the air gap,  $G$ , the discharge is oscillatory and takes place only between the plates,  $A$  and  $B$ . The inductances,



LL, choke the oscillations of such high frequency. In this form the oscillator has small capacitance and small inductance and, therefore, a high frequency of the order of 100,000,000 oscillations per sec.

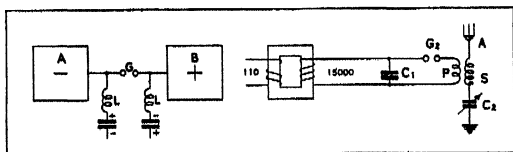


FIG. 2

HERTZ OSCILLATOR

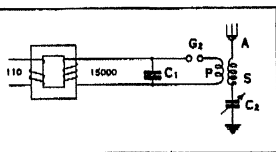


FIG. 3

A CLOSED CIRCUIT OSCILLATOR

Lower frequencies are obtained with the *closed-circuit oscillator*, one form of which is shown in Fig. 3. The condenser,  $C_1$ , when charged to near the peak voltage of the alternating current, discharges suddenly through the air gap,  $G_2$ . Such oscillators give damped oscillations.

The vacuum-tube oscillator gives undamped oscillations of any desired frequency and is now generally employed for the production of carrier waves in RADIO COMMUNICATION. The three-electrode tube (*see* TUBES, ELECTRONIC) amplifies the energy of the input, and when properly coupled, returns part of this energy to the input. Any electron displacement, such as the surge on closing the supply circuit, produces oscillations which increase in intensity up to the limit of the electron supply of the tube. These oscillations are sustained indefinitely and their frequency, which depends on the constants of the circuit, may be varied at will.

These oscillations may be produced by various kinds of circuits which may be divided into three main groups according to whether they use resistance, inductance or capacitance couplings between the output and the input.

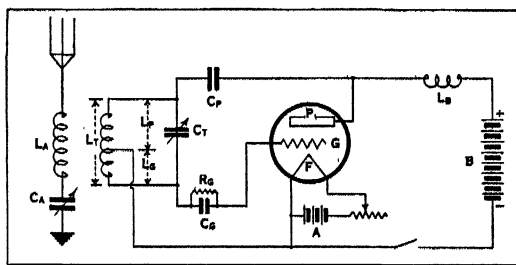


FIG. 4. HARTLEY CIRCUIT VACUUM-TUBE OSCILLATOR FOR GENERATION OF UNDAMPED ELECTROMAGNETIC WAVES

One of the best known circuits is the Hartley circuit, shown in Fig. 4. When the circuit of the battery,  $B$ , is closed, strong oscillations build up and then are indefinitely maintained in the tuned circuit,  $C_T L_T$ . Strong open circuit oscillations are induced in the tuned ANTENNA when it is coupled to this circuit as shown. *See also* OSCILLATORY CIRCUIT.

A. Z.

**OSCILLATORY CIRCUIT**, a circuit in which electricity oscillates or surges to and fro. In order

that such oscillations may be automatic, the circuit must include both CAPACITY and INDUCTANCE. A simple circuit of this character consists of a CONDENSER whose plates are connected by means of a coil of wire. If charged, such a condenser would immediately discharge through the connected coil, setting up a magnetic field in it. The energy originally stored in the charged condenser would now be stored in the magnetic field in and about the coil. Since there is nothing to hold it, this energy of the magnetic field flows out again in the form of a current pulse in the coil, recharges the condenser with plate potentials reversed, and the operation is repeated.

From another viewpoint, the action may be described as follows: The surge of electricity at the moment of the condenser discharge, on account of electric INERTIA, overshoots the mark, with the result that the condenser is again charged with its plate potentials reversed. A surge now takes place in the opposite direction, the oscillation going on until all the energy disappears. At a certain instant during each of these surges, the plate potentials are the same, and the energy stored in the condenser is zero. At this instant the total energy is stored in the magnetic field surrounding the discharge current. At the end of the surge, the energy is stored once more in the charged condenser, and the energy of the magnetic field is zero.

If there were no energy losses, these oscillations would continue indefinitely but some energy is lost at each oscillation through heating effects of the oscillating current in the coil and through energy radiation in the form of ELECTROMAGNETIC WAVES. Because of this inevitable dissipation of energy the oscillations are damped, and gradually die away. *See also* OSCILLATOR, ELECTRIC.

L. B. S.

**OSCILLOGRAPH**, an instrument for the study of rapidly varying electric currents and voltages, such as occur in alternating-current circuits and during changes in the electrical state of a circuit. By means of this device, a photographic record can be obtained showing the manner in which a current or voltage changes with time.

The operating element is known as the vibrator. It contains a MAGNET, or an ELECTROMAGNET, which sets up a magnetic field of high intensity in a short air gap. Located within the gap and perpendicular to the direction of the field is a loop of fine metallic ribbon, held under tension with the two sides parallel and separated. The length of the active section of the loop is controlled by the spacing of a pair of ivory bridges upon which the ribbon rests. About midway between the bridges, a very small mirror is cemented to the wires in such a way that any twisting of the loop produces a rotation of the mirror. The two ends of the loop are soldered to suitable binding post lugs by means of which a current can be passed through the loop.

In operation, the current to be studied, or a fraction of it, is passed through the loop while it is lo-

cated in the magnetic field. The electromagnetic force set up results in a deflection of the sides of the loop in opposite directions, and, hence, turns the mirror. In an element of proper design, the angle through which the mirror is turned at any instant is proportional to the current in the loop at that instant.

In order to observe and record the motion of the mirror, an optical system is included in the oscillograph by means of which a bright spot of light is projected on the face of the cell. The small spot reflected from the mirror passes through a LENS by means of which it is focused on either a photographic film or a translucent surface such as a ground glass plate.

For visual observation of the motion of the reflected light spot, a revolving or reciprocating mirror is commonly used. The action of this mirror is to cause the spot to move, with respect to the eye, in a direction perpendicular to the motion due to the vibrator element. Thus, a curve or wave can be produced and observed. If the wave is one that repeats itself, as for example a steady, alternating-current wave, the motion of the viewing mirror can be adjusted so that the wave appears to be stationary and can be traced on thin paper.

However, the great majority of oscillograph records are taken photographically. A sheet of sensitized photographic film or paper is mounted on a circular drum and located so that the light spot reflected from the vibrator element falls upon it. The drum is rotated by a motor while the light spot moves, and, thus, the successive positions of the spot are recorded as a line on the film.

It is customary to provide more than one element in an oscillograph so that different phenomena can be observed simultaneously. For many kinds of work it is necessary to use one element for timing, by connecting it to a voltage of known frequency, from which the interval of time corresponding to a given length on the record can be found.

Since the ribbons used in the vibrator elements are very delicate, it is necessary to protect them against burning out due to excess current. Many oscillographs contain within them the necessary series and shunt resistors to accomplish this, otherwise similar units must be employed externally.

Associated with the oscillograph is a shutter mechanism by which the record can be located properly on the film so that it will not cross over the junction between the two ends. This device alone is sufficient to procure good records of repeating phenomena. If the variation to be studied is not repeating, as, e.g., the current flowing during charge or discharge of a CONDENSER through a resistance, it is necessary to control the shutter by means of a special switch or relay which will open it a short time before the desired variation begins. Apparatus has been developed, particularly for the study of transmission systems during disturbances, which operates the whole oscillograph automatically.

Another type of oscillograph which has undergone

considerable development is the CATHODE-RAY oscillograph. In it records are made by deflecting a beam of cathode rays across a photographic plate. The control of the beam in accordance with the variation of the quantity under investigation is accomplished by impressing a varying voltage between a pair of deflecting plates or by passing a varying current through deflecting coils. In the first case, the cathode-ray beam passes through an electric field of varying intensity and in the second case through a magnetic field. The principal use of this device is in the study of extremely rapid variations, lasting in some cases only a few millionths of a second. W. H. T.

**OSCO-UMBRIAN**, two closely related ITALIC dialects of the INDO-EUROPEAN linguistic family. Oscan is preserved in over 200 inscriptions, mostly short, from Samnium, Campania, northern Apulia, Lucania, Bruttium and Messina (Sicily), and written both in Latin characters and in a derivative of the ETRUSCAN alphabet. They range for the most part from 300 to 90 B.C., and the longer texts deal with municipal affairs, a catalogue of shrines and deities, and a curse.

Umbrian, formerly spoken in the district still called Umbria, has survived only in the long "Iguvine Tablets," a text of over 4,000 words, also written in two alphabets, dealing with certain sacred rites, composed at various times and thus showing the development of the language.

The dialects are on the whole more archaic than LATIN, and in the noun they retain old inflections lost in the latter. The same statement holds for the syntax; but the verb is far less transparent even than Latin. Oscan is more conservative than Umbrian, particularly in its vocalism, which rivals that of GREEK for clarity. L. H. G.

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**O'SHAUGHNESSY, ARTHUR WILLIAM EDGAR** (1844-81), English poet, was born in London, Mar. 14, 1844. After 1870 he published several volumes of poems, the most important being *The Epic of Women*; others include *Lays of France and Music and Moonlight*. As a poet O'Shaughnessy belonged to the romantic school represented by ALGERNON CHARLES SWINBURNE. He died in London, Jan. 30, 1881.

**O'SHAUGHNESSY, MICHAEL MAURICE** (1864- ), American hydraulic engineer, born in Limerick, Ire., May 28, 1864. After graduating at the Royal University of Dublin, 1884, he emigrated to America. O'Shaughnessy held several high positions, among others that of chief engineer of the California International Exposition in San Francisco, 1893-94, of which city he was appointed engineer in 1912. O'Shaughnessy built the Hetch-Hetchy Water and Power Supply, the Eleanor Dam, the O'Shaughnessy Dam, the Priest Dam and Aqueduct, several tunnels and the San Francisco Municipal Railways. He also

was consulting engineer for Detroit, Seattle, San Diego and other cities.

**O'SHAUGHNESSY DAM**, located on the Tuolumne River, Cal., is part of the new water supply and power project being carried out by the City of San Francisco. It is of arch-gravity type, about 327 feet high above lowest foundation level, 226 feet above the river bed, and is so designed and constructed that it can be heightened 86 feet. The base thickness of 310 feet is sufficient for the future height. The present top length is 605 feet and it contains 398,000 cubic yards of concrete. The storage reservoir it creates has a volume of nearly nine billion cubic feet.

**OSHAWA**, a city of Ontario Co., and a port of entry, Ontario, Canada, situated on Lake Ontario, about 33 mi. northeast of Toronto. Given over to manufactures, Oshawa has a large motor works, woolen and textile mills, iron and brass foundries, plate glass works, tanneries, cold storage plants and canneries. Good public buildings, schools, a Carnegie library, many churches and five parks supplemented by smaller playgrounds, make it an agreeable, modern city. Its history dates from 1795 when Governor Simcoe built a military road, now King's Highway, between Oshawa and Kingston, 160 mi. long. Oshawa was incorporated as a city in 1924. Pop. 1921, 11,940; 1931, 23,439.

**O'SHEA, MICHAEL VINCENT** (1866-1932), American educator, was born at LeRoy, N.Y., Sept. 17, 1866. He was educated at Cornell University and from 1892-97 served as professor of psychology at the State Normal School, Mankato, Minn., and Teachers' College, Buffalo. In 1897 he became professor of education at the University of Wisconsin and attained a wide reputation as an authority and lecturer on child psychology and training. O'Shea is the author of *First Steps in Child Training*, 1920; *Faults of Childhood and Youth*, 1920; *The Child: His Nature and His Needs*, 1925, and *Newer Ways with Children*, 1929; and the editor of *The Junior Home Magazine* and *The Nation's Schools*. He died at Madison, Wis., Jan. 14, 1932.

**OSHKOSH**, a city in eastern Wisconsin, the county seat of Winnebago Co., situated on Lake Winnebago at the mouth of the Fox River Canal, 85 mi. north of Milwaukee. Bus and truck lines, airplanes, lake and river craft and three railroads afford transportation. Cattle and hog raising and dairying are carried on in the vicinity. In the early days Oshkosh was a leading lumber manufacturing city. It now manufactures wood doors, interior finish and numerous other products. In 1929 the factory output was approximately \$31,000,000; the retail trade amounted to \$23,688,817. A State Teachers College and the State Insane Asylum are located here. French explorers, in 1634, established a water route from Green Bay to the Mississippi River, which was later used extensively by the fur traders. The first permanent settlers came in 1836. Oshkosh was chartered as a city in 1853. Destructive fires occurred here in 1874 and 1875. Pop. 1920, 33,162; 1930, 40,108.

**OSIER**, the name given to various willows, the twigs of which are used in making baskets, hampers and similar articles. Among the principal species so employed are the common osier or basket willow (*Salix viminalis*), the purple osier (*S. purpurea*), the almond willow (*S. amygdalina*), and the crack willow (*S. fragilis*), together with numerous varieties and hybrids. The cultivation of various osiers has long been an important industry in the low wet lands of England, Belgium, France, the Netherlands and other countries of northwestern Europe. Osier culture has been established in various parts of the eastern United States, especially in Maryland, western New York and southeastern Michigan, but has not attained much commercial importance.

**OSIYEK**, a city of the former province of Slavonia, YUGOSLAVIA, located on the Drave River. Osijek is the chief commercial and industrial center of Slavonia; it manufactures silk goods, glassware, leather and flour, and has a large river trade in grain, meat, wood, fruit and honey. It was originally a fortress, which the Romans called Mursia or Mursa. The inhabitants are chiefly Magyars and Croats. Pop. 1931, 40,339.

**OSKALOOSA**, a city in southeastern Iowa, the county seat of Mahaska Co., situated 62 mi. southeast of Des Moines. Three railroads and bus lines serve the city. An airport was equipped in 1930. The city is a trading and shipping point for grain, hay and livestock, and there are iron foundries, wagon and wheelbarrow shops, clothing, and washing machine factories. The retail trade in 1929 amounted to \$6,948,864. Oskaloosa is the seat of Penn College, Oskaloosa College and National Holiness University. The city was founded in 1843, made the county seat in 1844, and was chartered in 1853. Pop. 1920, 9,427; 1930, 10,123.

**OSLER, SIR WILLIAM** (1849-1919), physician, was born at Bond Head, Canada, July 12, 1849. He was educated at Trinity College School, Port Hope, Trinity College, Toronto, and McGill University, Montreal, from which he received his M.D. degree. He also studied medicine in London, Leipzig and Vienna, was professor of medicine at McGill (1874-1884), at University of Pennsylvania (1884-1889), and Johns Hopkins University (1889-1904), and Regius Professor of Medicine at University of Oxford (1904). Osler's *Principles and Practice of Medicine* was considered in his time the best English textbook on the subject. He was editor of *Modern Medicine* (1910), and founder and editor of the *Quarterly Journal of Medicine* (1908). At the time of his death at Oxford, Osler was considered the greatest physician of our time. He was distinguished looking, had a bright personality, to which was added a careful training, clinical ability, wide knowledge and, above all, interest in humanity. In Osler's clinic at Johns Hopkins much important work was accomplished, for instance, studies of malarial fever, investigation of amebic dysentery, and an exhaustive study of PNEUMOTHORAX. M. F.

**OSLO**, the capital and largest city of Norway. It is situated on Oslo Fjord, on the southeastern coast, in a situation of rugged beauty at the foot of wooded hills, and is a well-planned modern city with handsome parks and garden suburbs. The original town was established by Harald Haardraade about the year 1050, and was an important northern center of the HANSEATIC LEAGUE. James VI of Scotland (James I of England) was married here to the Princess Anne of Denmark in 1589. Repeatedly devastated by fire, Oslo was rebuilt after a conflagration in 1624 by Christian IV of Denmark, after whom the new city was named as Christiania; it was so known for 300 years, the medieval name being restored in 1925. Oslo is an important port, accessible to the largest ships, and also an industrial center; the chief exports are timber, paper, paving-stones and fish, and the imports include textiles, grain and meat. In and about the city are shipbuilding yards, machine shops, breweries, flour-mills, paper-mills and other industries. The historical museum of Oslo is extremely interesting, its 9th-century Viking ships being especially celebrated. There are also an open-air national museum, a good collection of Norwegian paintings and a museum of industrial art. Pop. 1930, 253,124.

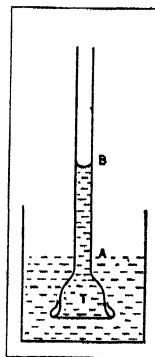
**OSMAN, HOUSE OF.** This dynasty gave its name to the Ottoman Turks who ruled the Ottoman Empire from 1289 until 1922. Osman the founder, an obscure figure, established a small state in Asia Minor along the Straits. His son Orchan is credited with organizing its civil and military administration with the system of tribute children trained as the Sultan's slaves. The next eight sultans carried through a series of territorial conquests which extended their rule from Hungary to Arabia, and from Algeria to Persia. Few dynasties can offer such a succession of able statesmen and energetic generals. The zenith is reached with Suleiman the Magnificent (1520-66). From his time to our own the dynasty has decayed under the influence of luxurious palace and harem life. Viziers or courtiers ruled the state, while the sultans were often puppets or the victims of palace revolutions. The end came when the Nationalist Assembly proclaimed the Turkish Republic.

**OSMENA, SERGIO** (1878- ), Philippine public official, Nationalist leader, was born in Cebu, province of Philippines, Sept. 9, 1878. He studied in the College of San Carlos, Cebu, and later in the College of San Juan de Letran. He received his degree in law at the University of Santo Tomas, Manila, and began practice in 1903. The following year he was chosen provincial governor of Cebu and then served as prosecuting attorney in several provinces. He became a member of the Philippine Assembly in 1907 and was unanimously chosen Speaker. He was re-elected as member of the Assembly 1909-19, continuing as Speaker of the Philippine Assembly and later of the House of Representatives for 15 consecutive years. He left the House of Representatives in 1922, upon his election as Senator. In the Senate he has been a conspicuous leader of the independence move-

ment of the Philippines, was one of the founders of the Nacionalista Party, and on various occasions headed Philippine Independence Missions sent to the United States.

**OSMIUM**, a chemical element belonging to the platinum metals, whose chemical symbol is Os, atomic weight 190.8. It was discovered by Tennant in 1803. As a metal, it is very hard and bluish in color. Its oxide, also called osmic acid, is a volatile substance whose fumes attack organic tissues, and may cause temporary blindness; in large doses it may even cause permanent injury.

**OSMOSIS**, the term applied to the selective flow of one or more components of a solution through a semi-permeable membrane. If a thistle tube is filled with a sugar solution and the larger end covered by a piece of animal membrane, such as a bladder or the skin of an egg, and these placed in pure water with the membrane below the surface, a diffusion of water takes place through the membrane into the tube (see figure). The solution rises in AB until its pressure in the tube is sufficient to prevent more water from entering. Thus, the water has been able to pass through the membrane in opposition to the hydrostatic pressure of the column, AB. These phenomena are called *osmosis*, the increase in pressure when equilibrium is reached being the *osmotic pressure*. The membrane is called a semi-permeable membrane. See MEMBRANES, SEMI-PERMEABLE.



APPARATUS FOR  
OSMOTIC PRES-  
SURE DEMONSTRATION

The above membrane, however, is not suited for measurements of osmotic pressure, for sugar diffuses through it to some extent; it lacks the strength and rigidity needed to support the pressure developed.

Pfeffer showed how to form, by chemical means, within the substance of a porous earthenware cell, a membrane which was entirely impervious to sugar in solution, while it freely transmitted water. A semi-permeable membrane formed in this way has great mechanical strength. Morse, who has improved Pfeffer's cell, has been able to measure osmotic pressures as high as 28 atmospheres, or 400 lbs. per sq. in.

Experiment shows that osmotic pressure is proportioned to the concentration of the solution, provided the temperature remains constant, and that quantities of dissolved substances which are in the ratio of their molecular weights exert equal osmotic pressure at equal temperatures.

The production of osmotic pressure may be accounted for if it is assumed that the semi-permeable membrane is porous and that the pores are of such a size that they will allow water molecules to pass through, but are too small to allow the larger sugar molecules to pass. Now, if the molecules of the liquid are in continual rapid motion, as the KINETIC

THEORY assumes, when a water molecule strikes the membrane it can pass through, but a sugar molecule striking the membrane will be unable to pass. Since there are fewer molecules per unit volume on the solution side of the membrane, fewer water molecules will strike the membrane, and pass through on the solution side than strike and pass through on the pure-water side. This results in the accumulation of water on the solution side which produces the osmotic pressure.

The cells which make up the bodies of plants and animals have semi-permeable walls; as a result, osmosis plays an important part in physiological processes which go on in living tissue. E. J. M.

**OSMUNDITES**, a name given to fossil ferns, known chiefly by their petrified stems, which agree in many details of anatomical structure with those of the living royal fern, *Osmunda*. The geological history of the osmundas has been clearly traced to Permian time, and comparatively recent discoveries indicate that the line may go back to the early Carboniferous. Well-preserved *Osmunda*-like stems referred to that period approach nearly in structure to stems of primitive Botryopterids, classed among early ferns, or PRIMOFILICES, with which according to Knowlton, a remote degree of kinship exists. Permian Osmundites had short stems, crowded fronds, and adventitious roots.

**OSNABRÜCK**, a German city in the province of Hanover, situated on the Else River about 29 mi. northeast of Münster. It was formerly the capital of an independent bishopric founded by Charles the Great about 810 on the site of a mission established in 772. It became a Hanseatic city and flourished greatly, sending its textiles to England, Italy and the Spanish colonies. The Reformation caused great discord and the Treaty of Westphalia provided that it be ruled alternately by a Catholic and a Protestant bishop. The streets are narrow and crooked, except in the square, where the Romanesque cathedral stands, and in the nearby market place, where the Gothic rathaus and the gabled houses are located. The industries of the city include textile mills and tobacco and paper factories, as well as several smaller factories. Pop. 1925, 89,079.

**OSPREY** (*Pandion haliaëtus*), a fish-eating hawk found in various forms practically throughout the world. It is about 2 ft. long, brownish above and white below, with a short, hooked beak, large feet, powerful, sharply curved claws and long, pointed wings. The New World form (*P. h. carolinensis*) is found almost throughout temperate and tropical America, forming large communities in regions where there is an abundant food supply. It feeds upon surface-swimming fish, hovering a moment over its prey and then plunging down with terrific force to seize it in its great talons. The osprey breeds in trees using always the same nest, which it enlarges each year until it reaches enormous size. It lays 2 or 3 buffy-white eggs with brown markings. If nest or eggs are threatened the osprey utters loud, piercing screams.

**OSSA**, the modern Kissavo or Kissovo, a mountain in northern Thessaly, Greece, east of the River Peneus. It is over 6,500 ft. high. Between Ossa and Olympus is the Vale of Tempe, the haunt of the Centaurs and Titans.



COMMON OSPREY OR FISH HAWK

**OSSEIN**, the collagen derived from bones. See COLLAGEN.

**OSSENDOWSKY, FERDINAND ANTONI** (1876- ), Polish writer and traveler, was born May 27, 1876 in Government Witebsk. He lectured at Tomsk University, was arrested as a Polish revolutionary in 1905 and after the Russian Revolution of 1917 joined Kolchak in Siberia. He traveled in Tibet and China and describes his adventures in *Beasts, Men and Gods*, 1923. Among Ossendowsky's other works are *Man and Mystery in Asia*, *The Living Buddha*, a play, and *Lenin, God of the Godless*, 1931.

**OSSETIC**, an Iranian language of the INDO-IRANIAN branch of the INDO-EUROPEAN linguistic family, spoken in the Central Caucasus area by some 20,000 persons. It falls into two subgroups, western (the more important) and eastern; and though it possesses no literature, it is of linguistic interest as being the modern representative of SARMATIAN.

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**OSSIAN** ("Oisín" or "Ossin"), a Celtic warrior and poet, possibly of the 3rd century, popular in Scotch and Irish literature. In two epics, *Fingal*, 1762, and *Temora*, 1763, James MacPherson, a Scotch schoolmaster, presented his alleged translations of some newly discovered poems by Ossian; but these are generally adjudged to be spurious.

**OSSIAN-NILSSON, KARL GUSTAF** (1875- ), Swedish poet and novelist, was born at Lund, July

30, 1875. His first collection of poems, *Masks*, appeared in 1900 and was followed by *Pagans*, 1901, and *Eagles*, 1902. Among his later collections of poems are *Orchestra* and *The Flying Ship*. His chief work of fiction is a trilogy of novels entitled respectively *The Barbican Forest*, *The Plain* and *The Sea*. Many of his novels and poems deal with social problems of the day. He has also written some plays and historical novels.

**OSSINING**, a village in Westchester Co., southeastern New York, situated on the eastern bank of the Hudson River, 30 mi. north of New York. It is served by the New York Central Railroad. Much of the fine rolling country in which Ossining lies is devoted to farming.

Leading manufactures are drugs, wire, maps and clothing. The industrial output, 1929, was valued at \$3,275,325. The retail business in 1929 amounted to \$10,354,740. Sing Sing Prison is on the outskirts of Ossining. Several private schools are situated here. Until 1901 the village was called Sing Sing, a name taken from the Sin Sinck Indians. Near by is Croton Point County Park. Pop. 1920, 10,739; 1930, 15,241.

**OSSOLI, SARAH MARGARET FULLER.** See FULLER, SARAH MARGARET.

**OSTEND**, a Belgian seaport and fashionable watering-place situated on the North Sea. Ostend is the terminus of a steamer route to Dover, and is on one of the foremost routes between England and the Continent. The city has a fishing school, a school of navigation, and is the headquarters of Belgium's fishing fleet. Pop. 1930, 43,954.

**OSTEND MANIFESTO**, a declaration written at Ostend, Belgium, in Oct. 1854, jointly by Pierre Soule, Minister to Spain; John Y. Mason, Minister to France; and James Buchanan, Minister to England, who were assembled to agree upon a concerted policy toward the acquisition of Cuba by the United States. The declaration, after characterizing the possession of Cuba by Spain as a menace to the United States, asserted that if Spain, "actuated by stubborn pride and a false sense of honor," should refuse to sell the island, the United States would be justified in acquiring it by force. The excitement over the BLACK WARRIOR CASE was then at its height, and the manifesto expressed the opinions of an aggressive minority of the American people. President Pierce, however, averted a difficult situation by issuing a disavowal of the manifesto.

**OSTEOLOGY**, the science dealing with the bony structure or skeleton of vertebrates. Scales, teeth, feathers, nails and hair also belong to the skeleton but occur on the outside of the body and are not included under the term osteology. The science of osteology deals with the various structures of bones, their articulations and protuberances.

Corresponding bones in the internal skeleton of vertebrates have similar location, structure and embryonic origin, which furnishes convincing evidence in support of evolution. The science of osteology has also enabled paleontologists to interpret fossil bones

of vertebrates and to reconstruct the bodies of animals that perished in remotely ancient geological ages. W. M. S.

**Anthropological Osteology.** The comparative study of human and anthropoid skeletons. The species studied are rather closely limited to the higher primates. The aim of this science is to establish by measurement and objective observation those differences which set off man from the apes, fossil men from modern men, child from adult, man from woman, race from race, and the pathological individual from the normal. With the exception of the skull (see CRANIOLOGY), the parts of the skeleton most thoroughly and frequently studied are the limb bones, pelvis and spinal column. Osteometry can be used on the dry bones of the dead and on the roentgenograms of the living.

The serious study of osteology was developed in Paris by the school of Paul Broca (1824-80). Comparison of the bones of ape, fossil man and modern man has been brilliantly done by Marcellin Boule in Paris and Arthur Keith in London. At present, the laboratories richly equipped with staff and material and most actively engaged in osteologic research are at the Anthropological Institute of the University of Munich, the United States National Museum in Washington, the American Museum of Natural History in New York City, the Peabody Museum of Harvard University, and the School of Medicine, Western Reserve University at Cleveland. R. S. W.

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**OSTEOMYELITIS, ACUTE.** See NECROSIS.

**OSTEOPATHY**, a system of medicine based on the principles that 1. The normal living body is a self-protective vital mechanism; 2. the power to produce within itself its own remedies and the ability of the blood to carry them where they are needed depend upon the body's structural integrity. In addition, there must be correct living habits, both bodily and mental, and proper sanitation and hygiene. Osteopathy itself is not a specialty, but includes the care of all types of disability and disease—those of women, of children, of the organs of special sense, of the circulatory system, digestive organs, and mental and nervous diseases, etc. Obstetrics and surgery have always been parts of this system.

The most important primary cause of disease is held to be some fault in the relationships of the tissues or organs of the body—bones, muscles, ligaments, tendons, fasciae or other. These faults are not so much the congenital variations from average form, though the influence of these is recognized, as they are the results of bad posture, accident, inflammation or infection. Reflexes from a diseased or damaged part may even pass over the nerves to produce tissue conditions in distant regions which in their turn constitute what the osteopathic physician calls "lesions."

These structural faults or "lesions" result in a slowing up of the circulation of the blood and lymph,

leading to edema and acidosis. Nerves are irritated and circulation in other parts is affected.

Thus not only are the vital processes of the bodily organs interfered with, but also the body's natural processes of making remedies to fight infection. This is in addition to the more obvious results of mechanical faults, such as crippled joints and muscles, including or related to the conditions so often called rheumatism, neuritis, neuralgia, arthritis, sciatica, lumbago, etc.

In diagnosis, osteopathic physicians employ the recognized scientific methods of physical, chemical and microscopic examination, including blood chemistry, roentgenology, basal metabolism tests, etc. The distinct thing about it is the study by observation, by the feel of the tissues and sometimes even by careful measurement of the mechanical faults referred to.

In the treatment of the sick, osteopathic physicians major in the specific manipulative correction of these structural abnormalities. They also give attention to the correction of errors in hygiene and sanitation, and in habits of thinking, work and play.

Osteopathy was introduced by Dr. ANDREW TAYLOR STILL in 1874. The first college was established at Kirksville, Mo., in 1892. In 1932 there were six recognized colleges and over 8,000 doctors of osteopathy in the United States, Canada, Great Britain and a few other countries.

R. G. H.

**OSTRAU, SILESIAN.** See SLEZSKÁ OSTRAVA.

**OSTRICH**, a ratite bird of the family *Struthionidae*, distinguished by having only two toes. The single variable species (*Struthio camelus*), which is sometimes 8 ft. tall, exists, scatteringly in the un-forested parts of Africa, except Egypt, and also in Arabia and Iraq. It is the largest bird in the world; the male is black with white wings and tail and the long neck covered with brownish down; females and young are gray. It subsists on desert plants, and wanders widely in search of what it likes, running at great speed, with a tendency to make large circles, aided a little by its much reduced wings. During the mating season it is usually seen in pairs, but sometimes a polygamous cock is accompanied by several hens. A hollow scraped in the ground receives the 20 eggs, about 20 in number, on which the hen, with neck and head outstretched on the ground, broods in the daytime, and the cock during the night. The nest is rarely left unguarded against the numerous robbers, and the adult birds are constantly attacked by the larger beasts of prey, defending themselves by powerful forward kicks.

Ostriches have always been hunted for the splendid plumes borne in their wings and tails. Since 1870, ostriches have been extensively reared in captivity in South Africa, California and elsewhere, and annually plucked. When the fashion-market is favorable the plumes produced on these farms command high prices. About no bird have so many quaint and erroneous fables arisen, as, for example, the long-exploded myth that when in danger it hides its head in the sand.

E. I.

**OSTRICH FERN** (*Onoclea Struthiopteris*), a hardy, strong-growing fern of the true-fern family often planted for ornament. It is found in moist thickets, especially along streams, widely throughout north temperate regions. In North America it occurs from Nova Scotia to British Columbia and southward to Virginia and Iowa. The plant rises from a stout ascending rootstock bearing a complete circle of handsome sterile leaves which surround several shorter fertile leaves with their divisions closely contracted into necklace-like segments. It is one of the most suitable native ferns for transplanting to gardens.

**OSTROGOTHS.** See GOTHS.

**OSTROVSKI, ALEXANDER NIKOLAEVICH** (1823-86), Russian dramatist, was born at Moscow Apr. 12, 1823, the son of a nobleman. Ostrovski, the first professional Russian dramatist, may be said to have created the realistic Russian theatre. *The Storm*, 1860, in which the heroine tries to break free from the grip of patriarchal tradition, is his most famous play. *Poverty Is No Crime*, 1854, is a comedy in which the hero prefers poverty and freedom of spirit to riches and social slavery. He produced many additional plays, many of them school classics. Ostrovski died at Kostroma, June 24, 1886.

**OSTWALD, WILHELM** (1853-1932), German chemist, was born at Riga, Russia, Sept. 2, 1853. In 1882 he became professor there, and in 1887 professor of physical chemistry at Leipzig. In 1905 and 1906 he was exchange professor at Harvard University. Ostwald made numerous discoveries in the field of electrochemistry, but his most famous, in 1900, was a method of oxidizing ammonia into oxides of nitrogen, a process which enabled Germany to maintain her production of explosives during the World War. He received the Nobel Prize in chemistry in 1909. In 1911 Ostwald resigned his post at Leipzig and devoted himself to philosophic studies, developing a school which he described as "energy" Monism, and to problems of color. (See MONISM.) He died at Grossbothem, Germany, Apr. 4, 1932.

**OSWEGO**, a lake port city in northern New York, the county seat of Oswego Co., situated on Lake Ontario at the mouth of the Oswego River and Canal, 35 mi. northwest of Syracuse. Inland water craft and three railroads serve the city. The shipments by lake and the State Barge Canal through the Oswego Canal for 1929 amounted to 403,453 tons, valued at \$21,848,652. Oswego has factories producing matches, textiles, foodstuffs, oil-well supplies and many other commodities. In 1929 the industrial output was worth about \$16,000,000; the retail trade amounted to about \$10,510,000. A state normal school is located in Oswego. Champlain came here in 1616. The English established a trading post in 1722, and the first fort was built in 1727. Oswego has been the scene of considerable warfare. Ft. Ontario, built in 1755-56, is now the oldest garrisoned fort in the United States. Oswego became the county seat in 1816 and was incorporated in 1828. It became a city in 1848. Pop. 1920, 23,626; 1930, 22,652.

**OSWEGO, BATTLE OF**, May 5-6, 1813, an engagement of the WAR OF 1812 which resulted in a British victory. As part of the British campaign to control Lake Ontario, Sir James Leo sailed from Kingston with eight large vessels and several smaller craft bearing 1,000 land troops, to capture Oswego and dismantle Ft. Ontario at the mouth of the Oswego River. The fort was garrisoned by 300 men under Col. Mitchell. The squadron protected the landing of the British troops at Oswego, 1,200 men under the active command of Col. Fischer. The troops fought an uphill battle to the fort, defeating a small body of militia which had been hastily summoned. Mitchell left the fort and made a counter-assault, but the Americans were forced back by superior numbers. The American loss was 69; the British, 94.

**OSWEGO TEA** (*Monarda didyma*), an erect aromatic perennial of the mint family called also bee balm. It is native to moist soils, especially along watercourses, from Quebec to Michigan, southward to Tennessee and Georgia, and is increasingly cultivated in several varieties for its showy flowers. The plant grows 2 or 3 ft. high bearing thin, lance-shaped, sharply toothed leaves and dense clusters of brilliant red flowers in conspicuous terminal heads. In colonial times the leaves were used as a substitute for tea.

**OTAHEITE APPLE** (*Spondias cytherea*), a stately tree of the cashew family closely allied to the mango, called also vi and ambarella. It is a native of the Society Islands, more or less cultivated in very mild climates for its aromatic edible fruit. The tree grows sometimes 60 ft. high bearing stiff branches, pinnately divided leaves, about a foot in length, small greenish-white flowers in long terminal clusters and an egg-shaped fruit, about 3 in. long, consisting of a juicy yellow pulp surrounding a spiny seed.

**OTELLO**, an opera in four acts by GIUSEPPE VERDI, libretto adapted by Arrigo Boito from the tragedy by SHAKESPEARE; première, Milan, Feb. 5, 1887; first produced in the United States, April 16, 1888, at New York. The opera was produced sixteen years after Verdi composed *Aida*. *Otello* is distinguished from other Verdi operas by its comparatively modern technique in musical structure. In opera form the story follows the main developments of Shakespeare's drama.

**OTHELLO**, a tragedy by SHAKESPEARE; produced about 1604. It is based principally on Cinthio's *Hecatommithi*, 1565. The chief character of this tragedy of jealousy, Othello, is a Moorish soldier who has risen to power in Venice. A trusting yet fiercely emotional nature, he loves Desdemona, his wife, passionately and trusts her implicitly. But the crafty Iago, who begrudges the Moor his power, approaches Othello and by false evidence and sly suggestions forces him to believe that Desdemona has been untrue to him with a young lieutenant, Cassio. Refusing to believe, he is at last convinced when he sees in Cassio's possession a handkerchief belonging to Desdemona. Insane with jealousy, he wounds Cassio and goes at midnight to the chamber where his wife is sleeping.

He wakes the innocent Desdemona, charges her with the blackest sins and smothers her where she lies. The Venetian officers arrive to arrest him, and then, too late, Othello discovers Iago's perfidy, and in remorse stabs himself. *Othello* ranks as one of Shakespeare's four greatest tragedies.

**OTIS, ELISHA GRAVES** (1811-61), American inventor, was born at Halifax, Vt., Aug. 3, 1811. In 1830 he went to Troy, N.Y., and worked as a builder until 1838 when he returned to Vermont and began the manufacture of wagons. He took charge of a machinery factory in Albany in 1845 and later of a general manufacturing establishment at Yonkers, N.Y. Here Otis invented the elevator safety brake, designed to stop the fall of a car if the supporting cables should break. This invention permitted the extensive use of elevators, and Otis gradually became primarily a manufacturer of elevators. In 1860 he and his sons organized N. P. Otis and Brother which in 1899 became the Otis Elevator Company. Otis made many improvements in elevators and invented a number of mechanical devices. He died at Yonkers, N.Y., Apr. 8, 1861.

**OTIS, JAMES** (1725-83), American revolutionary leader, was born at West Barnstable, Mass., Feb. 5, 1725. After graduation from Harvard he gained a reputation as a lawyer. He was Advocate-General for the colony in 1760 when the British customs officers applied to the Massachusetts Supreme Judicial Court for writs of assistance permitting general search of private property for smuggled goods. The court expressed doubts of its right to issue the writs and rather than argue the case for the government, Otis resigned his position. Accepting the position of counsel for the merchants who were opposing the petition, he spoke brilliantly against an encroachment upon the rights of the colonists which he asserted would lead to further violation of their freedom. He was elected to the Massachusetts General Court in 1761, where he was conspicuous as a brilliant orator and leader of the radicals. He published several notable pamphlets of much influence in the colonial cause. In 1769 his usefulness to the popular party was ended by a blow on the head which rendered him insane, aside from brief normal periods, for the remainder of his life. He was killed by lightning at Andover, Mass., May 23, 1783.

**OTITIS MEDIA.** See EAR, DISEASES OF.

**OTO**, an Indian tribe comprising with the Iowa and Missouri the Chiwere dialectic group of the North American Siouan linguistic stock. They occupied the territory west of the Missouri and south of the Platte in southeastern Nebraska. They were never an important tribe. Agriculture was their means of support and their villages consisted of large earth lodges. When traveling the members of this small tribe lived in tepees.

**OTOLOGY.** See EAR, DISEASES OF.

**OTRANTO**, a seaport of southeastern Italy, situated on the Adriatic coast. It is the seat of an archbishop. As the ancient Greek *Hydrus* and Roman



*Hydruntum* and again in the Middle Ages, its busy harbor was well known. In 1480, the Turks damaged the town almost irreparably. The 11th century cathedral has ancient columns and a splendid mosaic pavement. There is a castle at Otranto, erected by Alphonso of Aragon. Pop. 1931, 2,953.

**OTTAVA RIMA**, the Italian name for an eight-line stanza in iambic meter having three rhymes arranged in the scheme *ab ab ab cc*. Invented by the Italians in the 14th century, ottava rima became a classic form after Boccaccio's skilful use of it in his *Teseide*, 1340, and his *Filostrato*, 1347. It was employed by Boiardo in his *Orlando Innamorato*, 1486, Pulci in *Morgante Maggiore*, 1487, and by many others. In English, Byron has used the ottava rima most successfully in *Don Juan*, and Shelley less happily in his *Hymns of Homer*.

**OTTAWA**, a tribe of North American Indians speaking a dialect of the Algonkian linguistic stock. They lived in the territory north of Georgian Bay until driven west in 1650 by the Iroquois. Returning they settled on Manitoulin Island in Lake Huron and gradually spread into lower Michigan and parts of Ohio and Illinois. They were famous as traders and barterers. In all Colonial wars, including the uprising under Pontiac, who was an Ottawa, they sided with the French but were allied with the British in the Revolution and again in 1812.

**OTTAWA**, the capital of Canada and a city of the province of Ontario situated about 125 mi. west of Montreal at the confluence of the Ottawa, Gatineau and Rideau rivers.

The principal buildings and institutions are the Parliament buildings, a group of three imposing structures occupying a commanding position overlooking Ottawa River; the National Art Gallery; Government House; the residence of the governor-general; Royal Observatory; Royal Mint; Ottawa University; and the Central Canadian Experimental Farm.

The city is more than a political center. Industrially Ottawa has progressed greatly since the harnessing of the waters of the Chaudière Falls, thus supplying electricity for the lighting system and power for the railways and factories. The chief industries include planing mills, pulp and paper plants, iron works and clothing factories. There are immense industrial power plants on the Gatineau River. Ottawa is served by three railroads, the Canadian National, Canadian Pacific and New York Central. There is a government airport. Steamers travel through Rideau Canal to the St. Lawrence River and the Great Lakes during the navigation months. The park system of Ottawa has about 40 mi. of well-laid-out driveway and about 2,000 acres of beautiful park lands. Funds for maintenance are provided by the federal government.

Prior to 1854, the site of the present city was known as Bytown. Ottawa received its name from the river which in turn had derived its name from an Indian word signifying "to trade," applied to all the tribes who descended the river to barter with the French.

The city was selected as the capital of the Dominion in 1857. Queen Victoria made the choice, as the statesmen of the day failed to decide on the conflicting claims of Montreal, Toronto and Quebec. Pop. 1921, 107,843; 1931, 126,872.

**OTTAWA**, a city of northern Illinois and county seat of La Salle Co., about 85 mi. southwest of Chicago. It is situated on the Illinois and Michigan Canal, at the junction of the Illinois and the Fox rivers, and its railroad facilities include the Burlington and the Rock Island lines. Ottawa's industries, derived largely from natural resources of a region abounding in high-grade silica sand and having fire clay, shale, and coal deposits, and mineral springs, include the making of plate glass, fire brick, building tile, clay products, and farm implements for the important grain-growing interests of the county. In 1929 the value of the factory output amounted approximately to \$8,000,000; the retail trade reached \$9,188,007. The city is the seat of Pleasant View Lutheran College, founded in 1896, St. Francis Xavier's Academy for girls and a tuberculosis sanitarium. Ottawa is the eastern gateway to Starved Rock State Park and Buffalo Rock Park, and Shabbona Park is 14 mi. north. A monument commemorates the first Lincoln-Douglas debate which took place in Ottawa, Aug. 21, 1858. The town was settled in 1825 and incorporated in 1853. Pop. 1920, 10,816; 1930, 15,094.

**OTTAWA**, a city in eastern Kansas, the county seat of Franklin Co., situated on Marais des Cygnes, or Osage, River, 58 mi. southwest of Kansas City. Bus and truck lines and two railroads afford transportation. There is an airport. Oil and gas are found in this region. The city is a shipping center for grain and dairy products. Furniture, soap, sorghum and iron products are manufactured. Ottawa University is located here. A mission to the Indians was established here in 1836, and the site of Ottawa was an Indian reservation until 1865, when the city was chartered. Pop. 1920, 9,018; 1930, 9,563.

**OTTAWA, UNIVERSITY OF**, at Ottawa, Canada, a coeducational institution, founded in 1849 as the College of Bytown by the Oblate Fathers of Mary Immaculate. It became the College of Ottawa in 1861, and the University of Ottawa with power to grant degrees in 1865. By a papal brief it was accorded the status of a Catholic University in 1889. It has many affiliated convents, seminaries and academies. The library contains 25,000 volumes. In 1930 there was a student enrollment of 2,012 and a faculty of 702 professors and other instructors, headed by Rev. GILLES MARCHAND.

**OTTAWA RIVER**, the largest tributary of the St. Lawrence. It rises out of small lakes in southern Quebec and cuts a tortuous course westward to Lake Timiskaming. After issuing therefrom it flows south-eastward, forming the boundary line between the provinces of Ontario and Quebec, and empties into the St. Lawrence through two mouths separated by the island of Montreal. Its length is 780 mi.; the area of the drainage basin, 80,000 sq. mi. The lower

reaches contain numerous rapids separated by quiet stretches with occasional widenings into lakes. Above Pembroke the depth is over 5,000 ft. The city of Ottawa is situated on its lower course.

**OTTER** (*Lutra canadensis*), a large water weasel-like carnivore, sometimes measuring 40 in., the tail being half the length, and weighing 20 lbs. It has a long low body with short bowed legs and webbed toes. On land otters run awkwardly, but in water they are perfect swimmers, catching readily the fish which form their almost exclusive diet. The female rears three to five young in a nest hollowed in a stream bank. In England, otter are hunted with dogs. In North America, trapping has almost exterminated them. Otter fur is the standard by which all others are judged for wearing quality. It is thick, soft and lustrous, dark brown on the back, shading into gray and white below. The darkest and most expensive skins come from Labrador and the Canadian northwest.

**OTTERBIEN COLLEGE**, at Westerville, O., a non-sectarian, coeducational school founded in 1847 by three conferences of the United Brethren Church. Otterbien was one of the first colleges to admit women on an equality with men. It had productive funds in 1931 of \$1,297,332. The library contained 22,500 volumes. In 1931-32 there was a student enrollment of 388, and a faculty of 43 headed by Pres. Walter Gillian Clippinger.

**OTTOMAN EMPIRE**, the imperial domain of TURKEY founded by Osman, the first sultan of the Ottoman Turks, who reigned from 1288 to 1320. At the peak of its power in the 16th century the Ottoman Empire extended over most of southeastern Europe, much of western Asia and included part of northern Africa. The Imperial Government was commonly known as "the Sublime Porte." The empire fell in 1919 when MUSTAPHA KEMAL PASHA organized a nationalist Government. See TURKISH EMPIRE.

**OTTO OF FREISING** (c. 1115-58), son of Leopold III of Austria, the maternal grandson of Henry IV, and uncle of Frederick Barbarossa, was born about 1115. He was educated at Paris, joining the Cistercian Order shortly thereafter. In 1137 he was made bishop of Freising. He participated in the ill-fated Second Crusade, his army being destroyed by the Turks in Asia Minor. Under his nephew, the emperor Frederick Barbarossa, Otto enjoyed an honorable and influential position. His historical writing places him in the front rank of medieval historians. He composed a biography of his illustrious nephew covering the period 1076-1156. His chief work is *The Chronicle or The History of the Two Cities*, i.e. the earthly Babylon and the heavenly Jerusalem, being a history of the world from Adam to his own time. He regarded the Roman Empire as the last and greatest of the empires prophesied by Daniel. To Otto this empire was permanent, the imperial power being transferred at various times, finally to the House of Hohenstaufen. As an historian Otto displays remarkable objectivity, even to the point of

disapproving the vast temporal power and magnificence of the Church.

W. I. B.

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**OTTUMWA**, a city in southeastern Iowa, the county seat of Wapello Co., situated on the Des Moines River, 75 mi. northwest of Burlington. Four railroads and bus lines make the city a market center for the agricultural products of the vicinity, corn, oats, soy beans and live stock. The chief industries are meat packing and the manufacture of farm machinery and other steel products. The center of Iowa's bituminous coal fields is in the locality. In 1929 the industrial output reached about \$46,000,000; the retail trade amounted to \$13,819,662. About 3½ mi. away is the Ottumwa Legion airport. The noted Indian chief, Keokuk, was born here, and another chief, Wapello, is buried near the city. The site of Ottumwa was settled about 1843, and the city was chartered in 1857. Pop. 1920, 23,003; 1930, 28,075.

**OTWAY, THOMAS** (1652-85), English dramatist, was born at Trotton, Midhurst, Sussex, Mar. 3, 1652. He left Oxford without a degree in 1672, and three years later produced *Alcibiades*, in which the actress Mrs. Barry became famous, *Don Carlos* in 1676, and *Friendship in Fashion*, 1678. His unrequited love for Mrs. Barry led to his accepting military service in Holland, and on his return he produced the tragedies, *Caius Marius* and *The Orphan*, 1680. *Venice Preserved* appeared in 1682, and held the stage until the 19th century. Otway avoided much of the inflated manner of his times and possibly would have written plays of higher tragic order had the taste of his period allowed him. An account of his death states that he was forced to beg on the streets of London, and that, obtaining money, he rushed to a bakery and choked himself endeavoring to eat. He was buried Apr. 16, 1685, in the churchyard of St. Clement Danes.

**OUACHITA RIVER**, a tributary of the Red River, rising in Polk Co., Arkansas. It flows generally southeast out of Arkansas into Louisiana, receives the Tensas and Little rivers in Catahoula Co. and enters the Red River 34 mi. above its mouth. Throughout its course of about 550 mi. it is an alluvial stream with a moderate current. The area drained by it covers 18,230 sq. mi. By dredging the river and making other improvement, a 6½ ft. channel has been provided for year-round navigation to Camden, Ark., a distance of 351 mi. Cargoes of logs, grain and farm products aggregating 456,542 tons were transported over this stream in 1929.

**OUANANICHE**, a small variety of the Atlantic SALMON (*Salmo salar ouananiche*) found in the Saguenay River, Lake St. John and other lakes in Quebec. It weighs usually about 2 lbs. and is noted for its very gamy qualities. When hooked, it leaps high from the water, often several times in succession.

**OUDENARDE, BATTLE OF**, an engagement and decisive victory for the Allies, commanded by

Prince Eugène of Savoy and the Duke of Marlborough, in action on June 30-July 11, 1708, against the French commanded by Marshal Vendôme and the Duke of Burgundy. The battle was fought north of the Belgian town of Oudenarde, 18 miles south of Ghent. French casualties were 6,000, together with 9,000 troops made prisoners, as compared with the Allied loss of 3,000 killed and wounded.

**ODDH**, a province of India, forming one of the administrative divisions of the United Provinces, area 24,168 sq. mi. The region is a vast alluvial plain, watered by the Ganges and its tributaries, and for the most part highly fertile. It was formerly a Mogul province (subsequently kingdom, 1819), and became subordinate to the British after the battle of Kalpe, in 1765. The country was badly governed, and in 1856 the British annexed it and made it a chief commissionership. This measure proved so unpopular that when the mutiny of 1857 broke out, the Oudh sepoys joined it, and the siege of Lucknow followed. In recent years schools, hospitals and courts of justice have been established, and railways have been opened. The majority of the inhabitants are Hindus. Pop. 1921, 12,188,842; 1931, 12,795,080.

**OUIDA.** See RAMÉE, LOUISE DE LA.

**OUIJA BOARD**, a later name for the PLANCHETTE, or device to spell out messages alleged to emanate from spirits, by moving a small pointer on which the hand rests over a board containing the letters of the alphabet, the numbers, the words "yes" and "no" and other devices. The movements are more or less subconsciously directed by the sitter, though without knowledge that he is guiding them. See AUTOMATISM.

**OUNCE**, the snow leopard (*Felis uncia*) of the mountains and plateaus of Central Asia. This is a very powerful and beautiful cat, thickly marked with blackish rosettes on a light gray, woolly coat, highly prized by furriers. The ounce, which is rarely seen, dwells on the cold highlands, ascending tall peaks in quest of its prey which includes wild sheep, goats, deer, marmots, and snow-partridges. In winter the ounce descends to the higher valleys, seizing animals about the villages, though rarely permitting itself to be seen. The name ounce is applied in Brazil to the jaguar.

**OUNCE**, a unit of weight comprising 1/16 POUND avoirdupois and 1/12 pound troy. The avoirdupois ounce is equivalent to 437.5 grains and the troy ounce to 480 grains. The fluid ounce is a measure of capacity common in medicinal usage. In the United States, it is 1/128 of a GALLON, the volume of 456.033 grains of pure water at its maximum density or 29.57 cu. cm. In Great Britain, the fluid ounce is equivalent to an ounce avoirdupois of distilled water at 62° F., or 28.4 cu. cm. The ounce probably originated as 1/12 of the troy pound, and it derives its name from the Latin "uncia," a twelfth part.

**OUSE RIVER**, the name of three English rivers: 1, the Great Ouse, 160 mi. long, rising in Northamptonshire and flowing into the Wash; 2, a river in York-

shire, formed by the confluence of the Ure and the Swale near Boroughbridge, and flowing 60 mi. to unite with the Trent, both forming the Humber estuary; 3, a river in Sussex, draining part of the Weald and flowing into the English Channel.

**OUTBOARD MOTOR BOAT RACING**, the sport of competing in small craft equipped with outboard engines over water courses of varying lengths. The sport has its origin in the invention by Ole Evinsrud in 1910 of a light, single-cylinder engine which could be bolted easily to the stern of a rowboat. The early models weighed only 40 pounds, and developed about 2½ horsepower. As interest in this class of racing increased, outboard motors were designed to provide greater speed. In 1930-31 the outboard races were won by boats engined with 2- and 4-cylinder motors developing more than 35 horsepower, and weighing 150 pounds. After 1924, when outboard racing became a recognized event at the major regattas throughout the world, the boat design was largely standardized. At high speeds, the outboard skiff is mostly out of water, due to the discrepancy in weight between the motor and the craft. After 1928, the improvement in boat design and in engines made outboard racing a leading water sport throughout the United States, England and Australia.

In America the chief annual events are the Albany-New York City race down the Hudson River; the Peoria, Ill., to St. Louis, Mo., race; the Pulitzer Trophy event around Manhattan Island; the Staten Island marathon; the Intercollegiate Outboard Regatta; the Long Beach, Cal., race, and the National Outboard Championship. In 1928 the winner of the Albany-New York City race of 142½ miles averaged 25.4 knots an hour. In 1930 the winning time over this course was 39 mi. per hr., and in 1931 the victor attained an average speed of 41.9 mi. per hr. The winner of the Pulitzer race in 1930 circled Manhattan, a distance of 29½ miles, in 58 min., 45 sec. The steady improvement, notably in engine design, in outboard craft has resulted in new records at the majority of annual outboard regattas.

**OUTCASTS OF POKER FLAT, THE**, a tale of the Gold Rush days of '49, by BRET HARTE; published in a volume of stories and sketches, *The Luck of Roaring Camp*, 1870. This short history of John Oakhurst, gambler, portrays with humor and pathos a set of extraordinary characters—extraordinary but accurately drawn and completely typical of that strenuous era. This is one of the author's best stories.

**OUTCROP**, the exposure at the surface of the ground of geological formations, such as BED ROCK, a DIKE or VEIN, an ORE or MINERAL DEPOSIT, an intrusion of IGNEOUS ROCK or beds of SEDIMENTARY ROCK. See also GOSSAN.

**OUTERWEAR (KNITTED).** See KNITTING.

**OUTLAWRY OF WAR**, a school of thought in the United States that would brand war as "a public crime under the law of nations," and would create a code of international law to be applied by a World Court (see PERMANENT COURT OF INTERNATIONAL

JUSTICE) with compulsory jurisdiction over all purely international controversies. The enforcement of the decisions of the court would be entrusted to "the compelling power of enlightened public opinion" rather than to armed coercion.

BIBLIOGRAPHY.—C. C. Morrison, *The Outlawry of War*, 1927.

**OUTPOST**, a covering detachment thrown out in front of a resting command or a defensive position to secure against surprise and observation. It consists essentially of a system of outguards or lookouts stationed at commanding points and interconnected by patrols.

BIBLIOGRAPHY.—U.S. Army *Field Service Regulations*.

**OUTREMONT**, a city of Hochelaga Co., Quebec, Canada, entirely surrounded by Montreal, near the west end of Mount Royal Park, in the northern section of that city, yet preserving from it a separate municipal identity and government. Outremont is principally residential, and has the distinction of being Montreal's banking center. The village has five private schools, two Catholic and three Protestant. Its inhabitants are largely of French-Canadian extraction. Pop. 1921, 13,249; 1931, 28,641.

**OUTRIGGER**, a device which stabilizes the light dugout canoes used in the Indian and Pacific Oceans.



COURTESY METRO-GOLDWYN-MAYER

HAWAIIAN OUTRIGGER CANOE

An outrigger consists of a thin canoe-shaped piece of floating wood pointed at both ends which is held parallel to the axis of the boat at a distance of 2 or 3 beams by light poles. Both sides of a boat occasionally have outriggers, though usually they are attached to but one side.

The speed of the craft is not materially lessened by this additional rigging and

the light boats, thus stabilized, are able to face comparatively heavy seas.

**OUTWASH PLAIN**, a sandy or gravelly deposit spread evenly over a valley-bottom by sediment-bearing streams from a melting continental glacier. Sloping downward from the terminal moraine, the deposit of rock debris is coarsest near the ice, grading down to a sand plain. These extensive deposits, which may be 100 ft. thick, are valuable sources of gravel and sand for roadwork and building. The sandy, infertile, plain lying south of the terminal moraine on Long Island is an example of a frontal apron, or outwash plain. The city of Plainfield, N.J., is built on such a formation.

**OUZEL**, a name formerly applied to various Old World birds of the thrush family, especially to the blackbird (*Turdus merula*) and the ring ouzel (*Turdus torquatus*). The name is now generally restricted to the water ouzels, closely allied to the wrens, found along mountain streams and noted for their aquatic habits. Among these are the European WATER OUZEL

(*Cinclus aquaticus*), occurring in various forms in Europe, western Asia, and North Africa, and the American water ouzel or dipper (*C. mexicanus*), found mostly in and west of the Rocky Mountains from the Yukon to Central America.

**OVAL**, in general, a plane figure having the outline of an egg (Latin *ovum*, egg), or an ellipse. The term is often applied to a ground for sports, the seats being arranged in oval form. In geometry the term is applied to several curves. See CURVES; LEMNISCATE; CASSINI'S OVAL.

**OVARIOTOMY**, or **OÖPHORECTOMY**, the surgical removal of an ovary. If both ovaries are removed, it is termed bilateral ovariectomy. In women still in the menstruating age, ovaries are seldom removed, except when absolutely necessary. If both ovaries are removed from a young woman, the symptoms (menopause—see CLIMACTERIC) appear and they are usually severe. The indications for the removal of ovaries are usually tumors, either solid or fluid, benign or cancerous. If both ovaries are completely removed, the womb is likewise taken out, because the womb cannot function without at least a part of an ovary. On the other hand, when the womb is removed in a woman under 40 or 45 years of age, the ovaries, if normal, are nearly always left undisturbed. If, however, the woman has passed the menopause or if the womb is removed because it contains cancer, the ovaries are also taken out. Removal of one ovary does not interfere with the health or physiological functions of a woman provided the remaining ovary is healthy. A woman with one normal ovary menstruates and can bear children, and of both sexes. Partial ovariectomy is the removal of part of an ovary. A woman may continue to menstruate regularly even if she has only part of one ovary, but she can seldom become pregnant.

J. P. G.

**OVARY**, the organ in which ova develop, present only in the female of animals. The ovum or egg cell is the female sex cell of all animals except the most lowly. In some groups, as birds and reptiles, the egg cell attains a large size, from the storage of food materials, enabling it to develop outside the body.

In the human female the ovary is a paired structure about the size and proportions of the terminal segment of the thumb. The description of the formation of the ovum and its subsequent fate is given in GENERATIVE ORGANS.

In botany, the ovary is the lowest of the three segments of the pistil. In it the seeds are developed, and the resulting structure, often together with certain accessory contributions, is called the fruit.

**OVENBIRD**, one of a family (*Furnariidae*) of small South American birds allied to the wood hewers, so called from their curiously shaped nests. There are about 500 species in the family of which 12 species, from 5 to 7 in. long, with brown and white plumage constitute the genus *Funarius* or typical ovenbirds. The best known is the red ovenbird (*F.*

*rufus*) of Argentina, Uruguay and Paraguay. It is a very familiar bird, with a loud ringing note, commonly found near human dwellings. The dome-shaped, somewhat ovenlike nest, composed of mud and horsehair or rootlets, is built in trees or on rocks, fences or houses. It is a foot or more in diameter, often weighing 8 or 9 lbs. The pure white, pear-shaped eggs are laid in an inner chamber which is entered by a devious passageway. In the eastern United States the golden-crowned thrush, one of the warblers (*Seiurus aurocapillus*), is also known as ovenbird.

**OVERBURDEN**, the loose soil, sand or gravel which overlies solid rock, or **BED ROCK**. It also refers to the mantle of glacial **DRIFT** left by melting glaciers. Thus, in geology, overburden means unconsolidated material covering solid rock. In mining, however, it applies to the formations, loose or solid, which overlie a **MINERAL DEPOSIT**, as to beds of shale and sandstone which often cover seams of **COAL**.

See also **MINING**, **COAL**; **QUARRYING**; **STRIPPING**; **TRENCHING**.

**OVERBURY, SIR THOMAS** (1581-1613), English author, was born in 1581 at Compton Scorpion, in Warwickshire. Through the influence of Robert Carr, later Viscount Rochester, and the favorite of James I, Overbury rose to power. His outstanding works are *The Wife*, a poem, and the prose *Characters*. His opposition to Carr's marriage to the infamous Countess of Essex led to his imprisonment in the Tower, and to his death there, Sept. 14, 1613, from poison perhaps given by agents of the countess.

**OVERCAST**, in mining, a passageway designed to take one airway over another where the two meet at the same level. It is constructed by stopping the ends of one airway and connecting them by a "U"-shaped passage over the other.

**OVER DRAFT**, a check for an amount greater than the writer has on deposit. It is the duty of the ledger clerk to report checks drawn against insufficient deposits. When this happens the bank notifies the customer that his account is overdrawn. In most instances the bank will hold the check for the depositor to make good the deficit until the close of banking hours on the day the check is received. If the deficit is not made up, the check may be protested, in which case it will be sent back through the various endorsers to the maker of the check and surcharge will be added to the face of the check by the banks handling it.

**OVERSOUL**, an Emersonian term used to designate the Absolute, the soul of the world. It is essentially a mystical conception in which the distinction between subject and object is lost, and the ground principle is thought of in terms of concepts of value.

**OVERTONES**, known also as **partials** and **HARMONICS**, are secondary tones of prime importance to the tone-color of music. See also **TONE**; **MUSICAL SOUNDS**.

**OVERTURE**, the title of a musical composition for orchestra played before the beginning of a dra-

matic entertainment. In 1608 **CLAUDIO MONTEVERDE** affixed a toccata-like composition before the opening of his opera, *Orpheus*, and with that the modern overture had its inception. It did not approach an art-form, however, until J. B. **LULLY** featured it during his tenure in 1672-87 as composer-conductor at the Paris Opéra. This typical French overture was later taken up by J. S. **BACH** and **HANDEL** and classicized in their works. In the operatic overture it is customary to start with a brief announcement of a few loud notes in slow tempo, to focus the attention of the listeners, and to follow with a broad, melodious theme for a solo instrument, or instruments, taken from a portion of the opera itself. In **ROSSINI**'s overture to *William Tell* this introductory melody is played on a solo 'cello while with **WEBER**'s classical overture to *Der Freischütz* the opening melody is given to the quartet of French horns.

The composition then proceeds to a rather lengthy **ALLEGRO** movement which is often in a minor key and played by the full orchestra. Having developed this lively mood, the music then modulates into another contrasting section, slower than the one preceding it, and of a varied character, according to the imagination of the composer. In the *Poet and Peasant* overture by F. von Suppe, this portion of the overture-form appears as a lilting waltz movement whereas in the great *Tannhäuser* overture by **RICHARD WAGNER** the interruption is made by using the ethereal music later sung by women's voices in the Venusberg scene of the first act. The next section of the overture may be still another theme from the opera, in lively tempo; a combination of themes already used, in suggestive contrapuntal fashion, or, as in the case of **WEBER**'s *Freischütz*, a return to the first *allegro* but this time in its relative major key. In every instance the overture closes with a definite finish, accentuated by a repetition of the last phrase, *fortissimo*, in order to give the ending an added emphasis. Thus, the overture gives a bird's-eye view, as it were, of the principal themes that are later heard on the stage.

There is also a large list of overtures composed originally as purely concert numbers for symphony orchestra and briefly designated only by their titles, as, for example, **Beethoven**'s *Coriolanus*, **Mendelssohn**'s *Hebrides*, or **Tschaikowsky**'s *1812*. The light opera overture follows, more or less, the form outlined above while the "overture" to a musical comedy is usually only a collection of song-refrains strung together in agreeable contrast, but with little attempt to preserve a set form.

T. S.

**BIBLIOGRAPHY**.—F. Niecks, *Historical Sketch of the Overture*, 1905-6; A. Carse, *Early Overtures*, 1921.

**OVID** (43 B.C.-17 A.D.), Roman poet, whose full name was **Publius Ovidius Naso**, was born Mar. 20, 43 B.C., at Sulmo, now Sulmona, Italy, of a family of equestrian rank. His father sent him to Rome at an early age to be trained in rhetoric, with a view to a legal career. After visiting Greece and Asia to complete his education, he entered into public life. Ovid's own inclinations, however, were toward literature, and

in his early twenties he abandoned law and politics to devote himself entirely to poetry. He soon became a very popular figure in the pleasure-loving society of the Augustan Age. Before reaching the age of 30, he had divorced two wives and married a third. In 8 A.D. the poet was suddenly banished by Augustus to Tomi, a town on the Black Sea. The reason for this action is unknown; it is conjectured that Ovid's implication in one of the love affairs of Julia, the emperor's dissolute granddaughter, may have been responsible. Whatever may have been the real cause, Ovid's repeated entreaties for permission to return to Rome were of no avail and he died in exile at Tomi in 17 A.D.

Ovid's poetic career falls into three well-defined periods. To the first, devoted almost exclusively to poems of sensuous love, belong the *Amores*, three books of erotic elegies; the *Ars Amatoria*, a humorous didactic poem on the art of love, in three books; and the *Heroides*, consisting of fictitious love letters from legendary ladies to their lovers. The second period deals mainly with mythological subjects; during this time Ovid wrote his most famous work, the *Metamorphoses*, in 15 books. It is composed in hexameter verse; the material is derived from Greek and Roman sources. The works of the third period, written at Tomi, include the *Tristia*, poems of lamentation, in five books, and the *Epistulae ex Ponto*, or *Letters from Pontus*, in four. Ovid's poetry, intended mainly for entertainment, is characterized by a ready wit and a smooth elegance and charm. He had a considerable influence on later Latin poetry, particularly in respect to meter. See also LATIN LITERATURE.

BIBLIOGRAPHY.—E. K. Rand, *Ovid and his Influence*, 1925.

**OVIEDO**, a city of northern Spain on the River Nalon, capital of Oviedo province, the former principality of Asturias. It has a Gothic cathedral founded about 1380, with numerous graves of kings and many relics, an old castle and a city hall. It also has a university, a museum and a library. Besides the royal arms factory, there are leather, hat, tableware, chocolate and other factories. From the latter half of the 8th century to the first part of the 10th, Oviedo was the capital of the first of the new Christian kingdoms in Spain. Est. pop. 1929, 76,048.

**OVIEDO Y VALDES, GONZALO FERNANDEZ DE** (1478-1557), Spanish historian, political leader and soldier. He went to the Indies in 1514 and served as *veedor* for some years. He returned to Spain to protest against the Spanish policy in America, which he considered bad, and coming back to America in 1520 served as lieutenant to the governor of Darien. Learning of a conspiracy against him, he again traveled to Spain where he accused Pedrarias Davila. He returned to America in 1526 as governor of Cartagena, but made several other voyages and held many posts. During the latter part of his life he was the official chronicler of the Emperor Charles V. In spite of a life of great activity, he found time to write

numerous histories, the most important of which was his *Historia general y natural de las Indias, islas y tierra firme del mar Oceano*, published in part in Sevilla, 1535-1537, and entire by the Real Academia de la Historia with prologue and notes by Amador de los Rios in 1851. This work was left incomplete, but still stands as one of the most important contemporary accounts of the Spanish colonies in America.

**OWATONNA**, a city in southeastern Minnesota, the county seat of Steele Co., on the Straight River, 71 mi. south of St. Paul. Bus lines and three railroads afford transportation. Owatonna is a trade center and shipping point for the grain, live stock and dairy products of the vicinity. The city has factories producing farm implements and acetylene lighting and ventilating apparatus. The State School for Dependent and Neglected Children is located here. Owatonna is an Indian word meaning Straight. The city was settled about 1855 and chartered in 1875. Pop. 1920, 7,252; 1930, 7,654.

**OWEN, SIR HUGH** (1804-81), Welsh educator, was born in Anglesea, Jan. 14, 1804, and privately educated at Carnarvon. He was chief clerk of the Poor Law Board for many years but resigned in 1872, to devote himself to the promotion of education in Wales. His early activities in behalf of education included a movement to open a school in Islington in 1839; the publication of *A Letter to the Welsh People*, designed to create interest in education, in 1843; and the establishment of the Cambrian School Society, in 1846. In his later years, Owen devoted himself to the promotion and organization of Welsh intermediate and higher education. Through his efforts the Bangor Normal School and the University College of Wales were established. In 1881 he was knighted. He died at Mentone, Nov. 20, 1881.

**OWEN, SIR RICHARD** (1804-92), English naturalist, was born in Lancaster, June 20, 1804. After wide scientific study he became conservator of the Museum of the College of Surgeons, London, in 1835 and at the same time conducted classes in palaeontology at the School of Mines and in physiology at the Royal Institution. From 1856 to 1883 he was in charge of the section of natural history of the British Museum. During these years he devoted himself unceasingly to reclassification of animals upon morphological principles, the basis of modern zoological classification. He was knighted in 1884, and died at London, Dec. 16, 1892.

**OWEN, ROBERT** (1771-1858), British social reformer, was born at Newtown, North Wales, May 14, 1771. When he was nine years old he left school and quickly won success in the cotton business in Manchester. In 1799 he bought the mills and village of New Lanark and put his original industrial and educational ideas into effect with great success. Owen believed that man's life and character are influenced almost entirely by his early environment. He therefore sought in every way to improve physical, moral, and educational conditions, in the factory, then in the community, then throughout the nation and the

world. He instituted many great industrial reforms, especially in the matter of child labor, he prepared the way for the co-operative movement, and was himself, a forerunner of the present Socialists. He came to America in 1825 and founded the New Harmony Community in Indiana, but that failed, and he returned to Great Britain. He died at Newtown, Nov. 17, 1858.

**OWEN, ROBERT LATHAM** (1856- ), American statesman, was born in Lynchburg, Va., Feb. 3, 1856. He attended private schools in Lynchburg and Baltimore, Md., and graduated from Washington and Lee University in 1877. He went to Indian Territory where he became principal of the Cherokee Orphan Asylum at Grand Saline, Cherokee Nation. He also studied law and in 1880 he was admitted to the bar and commenced practice in Tahlequah, Indian Territory, now the state of Oklahoma. From 1881-84 Owen was secretary of the board of education of the Cherokee nation, and from 1885-89 was United States Indian Agent for the Five Civilized Tribes. He later acted as attorney for various Indian tribes in litigious disputes which they had with the national government. When the provisions of the National Banking Act were extended to the Indian Territory, he organized the First National Bank of Muskogee in 1890 and acted as its president for 10 years.

Owen added politics to his numerous activities. He was a delegate to the Democratic national conventions of 1892, 1896 and 1926, and a member of the Democratic national committee, 1892-96. Upon the admission of Oklahoma as a state in 1907, he was elected to the U.S. Senate and reelected in 1912 and 1918. He declined to be a candidate for renomination in 1924 and in 1925, resumed the practice of law in Washington, D.C., retaining his legal residence in Muskogee. In the Senate, Owen was a facile debater and repeatedly evidenced his ability to gather a mass of factual information and then succinctly to explain its significance. He was co-author of the Glass-Owen Currency Act, 1913, which created the Federal Reserve System, and he helped to draft the bill which authorized the Federal Farm Loan Board, 1916. During the senatorial consideration of the Treaty of Versailles, he endeavored to effect a compromise between the extreme opponents and proponents of the League of Nations.

**OWENS, JOHN** (1790-1846), founder of Owens College, Manchester, England, was born in Manchester in 1790. His father was a furrier, manufacturer and shipper, and in 1817 Owens was admitted into partnership with him. He proved himself a capable business man. His health, however, was poor, and, obliged to lead a retired life, he developed a keen interest in the problems of education. He never married and it was his desire to leave his fortune to a friend, George Faulkner, who suggested that, as he was already well supplied with money, Owens would do better to found a college with his wealth. Owens adopted this suggestion. In his will he bequeathed £96,654 to trustees for the foundation of an insti-

tution "providing or aiding the means of instructing and improving young persons of the male sex (and being of an age not less than fourteen years) in such branches of learning and science as are now and may be hereafter usually taught in the English universities." The college was founded and opened in 1851. Owens died in Manchester on July 29, 1846.

**OWENSBORO**, a city in northwestern Kentucky, the county seat of Daviess Co., situated on the Ohio River, about 114 mi. southwest of Louisville. Three railroads, bus lines, trolleys and river steamers afford transportation. There is an airport. Owensboro manufactures a variety of products, including engines, farm machinery, lumber, tobacco, clay products, automatic garage doors, iron products, furniture, canned food, electric lamps, stock feeds and radio tubes. The factory output, 1929, was valued at \$10,867,976. In 1929 the retail business amounted to \$9,425,983. Diversified farming is done in the region, which produces also oil, gas, coal and clay. The town was settled about 1800 and incorporated 17 years later. Pop. 1920, 17,424; 1930, 22,765.

**OWEN SOUND**, the capital of Grey Co., and a port of entry of Ontario, Canada, situated at the mouth of Sydenham River, at the head of Owen Sound, about 122 mi. northwest of Toronto. Fish, timber and grain of the district, and local manufactures of leather, stoves, cereals, furniture, flour and machinery, comprise the local industries. Owen Sound has a good harbor and shipbuilding is a flourishing industry. Situated in a beautiful countryside and charmingly laid out, the city is a favorite summer resort. Surveyed in 1843 by Richard Rankin, it was



G. M. SUTTON. "BIRDS OF PENNSYLVANIA"  
J. HORACE McFARLAND CO. COPYRIGHT

GREAT HORNED OWL

incorporated in 1857 as a town and in 1920 as a city. Pop. 1921, 12,190; 1931, 12,839.

**OWL**, nocturnal birds of prey belonging to the family *Strigidae* and *Tytonidae*. Although these are



truly birds of prey, fitted by their soft plumage and large eyes for the nocturnal hunting which is their habit, they are classed in structure not with the hawk but between the parrots and the goatsuckers. They function as destructively among the birds as do cats among mammals. Most owls nest in hollow trees, on cliffs or in old crow and hawk nests, but the burrowing owls of the plains nest in burrows in the ground and the short-eared owl, whose life is spent mainly in search of mice and frogs, nests in wet meadows. Owls vary in size from the pygmy owl of the Southwest, not much larger than a sparrow, to the circumpolar snowy owl, 25 in. long. The larger owls catch grouse, rabbits and other small animals, and occasionally go abroad by day; the smaller kinds live on birds and mice. Among the American species are the great-horned owl, the barred owl, the saw-whet, the screech owl, barn owl, and the western pygmy owl. All owls lay white, nearly spherical eggs.

E. I.

**OWL'S-CLOVER**, the general name for a numerous genus (*Orthocarpus*) of plants of the figwort family. There are about 30 species native chiefly to the western United States, 24 of which are found in California. Nearly all are annual herbs with



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OWL'S-CLOVER

(*Orthocarpus fasciobarbatus*). A showy valley species of the California coast. Cross section of ovary, leaf and flowering branchlet

sessile, often deeply cut leaves and numerous irregular flowers borne in showy terminal spikes interspersed with more or less highly colored floral leaves. Among the best known species are the purple owl's-clover or escobita (*O. purpurascens*), common from Washington to California; the woolly-flowered owl's-clover or Johnny-Tuck (*O. erianthus*), and the showy owl's-clover (*O. densiflorus*).

**OWOSSO**, a city of Shiawassee Co., southeastern Michigan, situated on both sides of the Shiawassee

River, about 33 mi. northeast of Lansing. It is served by three railroads and bus lines. There is a municipal airport. The sugar-beet industry thrives here. Manufactures include sugar, automobile bodies, flour and iron. Located at Owosso are the repair shops of the Ann Arbor Railroad. In 1929 the factory output was worth about \$11,000,000; the retail trade amounted to \$11,649,943. Owosso was founded in 1833 and incorporated in 1859. Pop. 1920, 12,575; 1930, 14,496.

**OWYHEE DAM**, located on the Owyhee River, Ore., is of massive concrete, arch-gravity, non-overflow type and will be, until the completion of the Hoover Dam, the highest in the world. Its greatest height above foundation level is 525 feet and above the stream bed 350 feet. The maximum thickness at the base is 265 feet and the top length is 850 feet. The spillway is a vertical shaft connecting with a tunnel 22 feet in diameter, both excavated through the rock wall of the canyon at one end of the dam. The volume of the dam is 540,000 cubic yards. It creates an irrigation storage reservoir having a capacity of 49 billion cubic feet. An unusual feature of the construction of this dam was that the work of excavation for and placing concrete in the deepest portion of the dam was done through vertical shafts, after concrete had been built up to a height of 50 feet, so as to support itself across a fault zone about 30 feet wide and 125 feet deep.

F. K.

**OX**, a member of the genus *Bos*; a bovine mammal. The oxen represent the typical and most numerous division of the hollow-horned, cloven-hoofed family *Bovidae*. They are distinguished by large and stout size, almost uniform dark coats, naked muzzle, and especially by the fact that the horns stand out from the sides of the skull and are simply curved and smooth, not twisted or ringed. The genus contains, if bisons and buffaloes be included, about a dozen species, native in all parts of the world except Australia, South America and Madagascar. All may interbreed in captivity, which has resulted in a great variety of domesticated races. Oxen are grazers, polygamous, and inclined to be gregarious, although the forest-dwelling species are less so than those of the plains. Several fossil oxen have been described, and a few others, present in Europe, since historic times, have become extinct or nearly so. See AUROCHS; BISON; BUFFALO; GAUR; YAK.

E. I.

**OXALIC ACID**, a white crystalline substance ( $C_2H_2O_4 \cdot 2H_2O$ ) used widely in dyeing, cloth printing, bleaching and similar applications. It is soluble in hot water, has a strong acid taste and is very poisonous. It may be prepared by the action of nitric acid on sugar, starch or cellulose; also commercially by the action of potash on sawdust.

**OXALIS**, a numerous genus of herbs of the wood-sorrel family. There are about 300 species of worldwide distribution but most numerous in South Africa and tropical America; about 25 are found in North America. They are either stemless or short-stemmed plants, mostly perennial, often rising from tuberous or bulbous underground parts and characterized by



a sour sap. The alternate leaves, usually composed of 3 to 5 notched leaflets, are sensitive to light, "going to sleep" at night. The attractive flowers, borne in axillary clusters, range in color from white to yellow, pink and red. Various species are grown in hanging baskets and window gardens; others are greenhouse plants; a few are suitable for borders, and several are widespread as weeds.

**OXENSTJERNA, COUNT AXEL** (1583-1654), Swedish chancellor, was born in Uppland, Sweden, in 1583. **GUSTAVUS ADOLPHUS** made him chancellor in 1612 and during the periods of the king's absorption in the Russian and Polish campaigns he served as vice-regent. Count Axel died at Stockholm Aug. 28, 1654. He is generally recognized as not only one of the most illustrious statesmen in Swedish historical annals, but as one of the greatest men in the Europe of his day. His ability to find allies, to furnish the army of Gustavus with money to carry on campaigns and his skill in concluding treaties advantageously raised Sweden to a position in Europe which it had never held before.

**OXEYE DAISY** (*Chrysanthemum Leucanthemum*), a vigorous perennial of the composite family closely allied to the florists' chrysanthemum. It is a native of Europe and northern Asia and widely naturalized in North America, often becoming a pestiferous weed. The smooth, sparsely branched stem, 1 to 3 ft. high, bears coarsely toothed, more or less divided leaves and long-stalked, showy flower-heads with pure white rays and a bright yellow center.

**OXFORD**, a municipal borough, university seat and the county town of Oxfordshire, England, situated in lowlands between the Thames and Cherwell rivers, 51 mi. by road northwest of London. Undoubtedly existing in Roman times, it is first traceable in the Anglo-Saxon Chronicles, 912. After the Conquest the Normans became active and built the castle of which a tower yet stands. The 13th century which saw the foundation of the University, marked the height of Oxford's medieval glory when it was politically important and the scene of several Parliaments including the Mad Parliament. To-day it is a picturesque city of twisted, narrow lanes, broad roads and mellowed buildings, struggling against a rapidly encroaching modernity. To the north lie the University buildings and grounds; across the Christ Church meadows runs the celebrated Broad Walk; and beyond Magdalene bridge is the modern residential area. In spite of the efforts of some of its citizens, automobile works at Cowley nearby, and other modern undertakings, are supplanting the dignified private printing enterprises and small manufactures of the old Oxford, and making the city something of a modern industrial center. Pop. 1921, 67,290; 1931, 80,540.

**OXFORD**, a city in northern Mississippi, the county seat of Lafayette Co. It is situated 75 mi. southeast of Memphis, Tenn. and served by one railroad. Oxford is a trade center in a corn- and cotton-growing region, and the seat of the University of

Mississippi. The city was founded and incorporated in 1837. Pop. 1920, 2,150; 1930, 2,890.

**OXFORD**, a city and county seat of Granville Co. in northern North Carolina, situated about 30 mi. northeast of Durham. Truck bodies, automobile packing cases and box shooks are the principal manufactures. Bus lines, numerous highways and two railroads serve the city. It is a trading center for tobacco, cotton, and corn raised in the region. John Penn, a signer of the Declaration of Independence, was born in Oxford. It was founded in 1759 and incorporated in 1812. Pop. 1920, 3,606; 1930, 4,101.

**OXFORD, PROVISIONS OF** (1258), an important document in English constitutional history. The Mad Parliament, so-called, met at Oxford. A temporary committee of 24 members was appointed to deal with grievances in Church and State. A permanent body of 15 was to act as council to the King, Henry III. Also they were to hold three annual Parliaments and to consult with 12 representatives of the barons. Another committee of 24 was to handle aids, or financial appropriations. In these arrangements, the elements of a Parliamentary system are discernible. See ENGLAND; PARLIAMENT.

**OXFORD CATHEDRAL**, Oxford, England, the smallest cathedral in England. It goes back to a traditional foundation in the 8th century, and some authorities believe that much pre-Norman construction is still standing. But the cathedral is generally dated as transitional Norman work of the late 12th century, with additions of the 13th century and some alterations of the 14th. In the 16th century Cardinal Wolsey removed the three western bays of the nave, reducing the size of the original church.



OXFORD CATHEDRAL, NAVE AND CHOIR

The most conspicuous feature of the late Norman nave is the double-tying, by means of which the lower arch and triforium are included under a single rounded span. The nave has an ornate timber roof,

generally attributed to Cardinal Wolsey. The clerestory arches are pointed. The Early English lady chapel, built in the 13th century, is unusually situated east of the north transept. The 13th century steeple was the first large stone spire in England. The cathedral contains some old glass and several beautiful stained glass windows by Burne-Jones and William Morris.

**OXFORD MOVEMENT, THE**, sometimes called the Tractarian Movement, the name given to an agitation within the Church of England in support of High Church principles, in opposition to the tendency toward liberal views and rationalism. It originated at Oxford University in 1833, a sermon preached by Dr. Keble on July 9 of that year, on "National Apostasy," being generally regarded as inaugurating the discussion. The latter part of the same year John Henry Newman, later cardinal, started his *Tracts for the Times*, which accounted for the name Tractarian. The Oxford Movement aimed to obtain for the Church of England a foundation of doctrine and discipline which should serve for the clergy in the event of disestablishment, or in the event that they should decide to withdraw from the establishment. The movement virtually ended when Dr. Newman joined the Roman Catholic Church in 1845.

**OXFORD STREET**, the busiest shopping street in London, England, extending from the Marble Arch to Holborn. The street, which is noted especially for its department stores, was formerly called Tyburn Road, but was renamed in 1725 for Edward Harley, Earl of Oxford.

**OXFORD UNIVERSITY**, the older of the two ancient English universities, situated at Oxford, in Oxfordshire. The earliest nucleus of this great seat of learning existed in the small schools that sprang up within the precincts of the dissolved priory of St. Frideswide and Osney Abbey, early in the 12th century. Various religious orders, notably the Dominicans, Franciscans and Carmelites, settled at Oxford in the 13th century: their coming tended to advance the educational standards and facilities. In 1249 the first distinct college of Oxford, called University College, was founded by William of Durham. It was followed, in 1263, by Balliol College, founded by John de Balliol. The third, Merton College, was founded by Walter de Merton in 1264. The present university is divided into 21 colleges, each of which is an individual corporation functioning within the larger corporation of the university. The colleges of Oxford, besides the three already mentioned, are: Exeter, Oriel, Queen's, New College, Lincoln, All Souls, Magdalen, Brasenose, Corpus Christi, Christ Church, St. John's, Trinity, Jesus, Wadham, Pembroke, Worcester, Keble, and Hertford. Non-collegiate members of the university belong to St. Catherine's College. There are four women's colleges: Somerville, Lady Margaret Hall, St. Hugh's, and Hilda's. There are also four independent foundations, devoted chiefly to the teaching of theology: Wycliffe Hall, Pusey House, Mansfield College and Manchester College.

Instruction at Oxford is carried on by means of lectures supplemented by individual tutoring. At matriculation each student is assigned a tutor, under whose supervision he remains during his residence. The faculties include Theology, Law, Medicine, Literae Humaniores, Modern History, English Language and Literature, Medieval and Modern Languages, Oriental Languages, Physical Sciences including Mathematics, and Biological Sciences. There are also boards of studies for Music, Philosophy, Politics and Economics. The university offers numerous scholarships, the RHODES SCHOLARSHIPS being the best known in America. The buildings and grounds of Oxford are extensive. Of special interest are the Bodleian Library, containing 1,250,000 printed volumes and about 40,000 volumes of MSS.; the Radcliffe Library; Taylor Institute; the Ashmolean Museum; St. Mary's Chapel and Cathedral; the Pitt-Rivers Ethnographical Museum; the Clarendon Press, and the Convocation House. In 1929-30 Oxford University enrolled 4,572 full-time students. The chancellor of Oxford in 1930 was the Rt. Hon. Edward, Viscount Grey. The number of women students, who were first admitted as full members in 1920, has been limited to one-fourth that of the men.

**OXIDATION AND REDUCTION**, concurrent chemical processes, the former consisting in an increase in the positive valence or a decrease in the negative valence of an element; the latter consisting in a decrease in the positive valence or an increase in the negative valence of an element. In more modern terminology the former consists in a gain of ELECTRONS, the latter in a loss of electrons. Thus in the smelting of iron ore  $\text{Fe}_2\text{O}_3$ , for instance, the ferric oxide is reduced to metallic iron by carbon monoxide,  $\text{CO}$ , which is concurrently oxidized to carbon dioxide,  $\text{CO}_2$ . In this case iron is reduced from a valence of plus three to a valence of zero, while carbon is oxidized from a valence of plus two to a valence of plus four.

Compounds, or elements, are said to be strong reducing agents if they are able to give up electrons to a large number and variety of other substances. They are said to be strong oxidizing agents if they are able to acquire electrons from many and diverse other substances. The terms are obviously relative. O. R.

**OXIDES**, the products formed when OXYGEN unites with other elements. Oxides of all metals are known, although some can not be produced by direct union of the elements. Oxygen also combines with non-metals. Both metallic and non-metallic oxides combine with water to form *hydroxides*, basic hydroxides being formed in the first case and acidic hydroxides in the second case. In some oxidation processes, the resultant compound contains more oxygen than the simple oxide, and such compounds are termed *peroxides*. Thus, sodium burned in air produces  $\text{Na}_2\text{O}$ , but forms  $\text{Na}_2\text{O}_2$  when burned in oxygen. When oxides are formed, heat is liberated by the reaction, as exemplified by ordinary combustion of fuels.

**OXLIP**, a well-marked floral variety of the true PRIMROSE (*Primula veris*); the flower differs in having a broad flat border.

**OXNAM, GARFIELD BROMLEY** (1891- ), American educator, was born in Sonora, Cal., Aug. 14, 1891. He was educated at the universities of Southern California and Boston. After being ordained a Methodist Episcopal minister in 1916, he was pastor of the Church of All Nations in Los Angeles from 1917-27, and professor of practical theology at Boston University from 1927-28. In 1928 he became president of DePauw University. Oxn timer is the author of *The Mexican in Los Angeles* and *Youth and the New America*.

**OXNARD**, a city in Ventura Co., southern California, 5 mi. from the Pacific Ocean, 40 mi. south-east of Santa Barbara. It is served by bus lines and the Southern Pacific Railroad. There is a private airport. Oxn timer is a trade center for a district producing chiefly lemons, sugar beets, lima beans and other vegetables. Beet sugar and farm machinery are the principal manufactures. The city was founded in 1897 by the American Beet Sugar Co. and Robert Oxn timer. It was incorporated in 1903. The Oxn timer hospitals have become noted for their Twilight Sleep methods. Every year since 1924 the unique Eisteddfod, a contest in art crafts for the county, has taken place at Oxn timer. Near Point Mugu, southeast of Oxn timer, there is a national monument, on the site of Juan Rodriguez Cabrillo's landing-place in 1542. Pop. 1920, 4,417; 1930, 6,285.

**OXPECKER**, a genus (*Buphaga*) of African birds called also rhinoceros birds, allied to the starlings but differing in their very strong feet and claws and mainly grayish brown plumage. They derive their common name from their habit of alighting upon domestic cattle and large wild animals, as the elephant, rhinoceros and buffalo, to feed upon various parasites which infest them. Oxpeckers move in small flocks and utter harsh notes.

**OXY-ACETYLENE BLOWPIPE.** See WELDING; METAL CUTTING BY HEAT; GAS FLAME CUTTING.

**OXYGEN**, the gaseous chemical element in the air which supports the respiration of men and animals and the combustion of carbonaceous substances in fire. It has no color, odor or taste. Its chemical symbol is O (in the gaseous form O<sub>2</sub>); atomic number, 8; atomic weight, 16, being the standard to which the atomic weights of all other elements are referred. Oxygen has two isotopes (or rare forms) with atomic masses 17 and 18 which are present with oxygen 16 to the extent of about one part in ten thousand and one in a thousand, respectively. By means of pressure and cold, oxygen can be liquefied and even frozen solid. It melts at -218.4° C. (-361.1° F.) and boils at atmospheric pressure at -182.7° C. (-296.9° F.). Oxygen is the most abundant chemical element in the crust of the earth. It forms 21% of the atmosphere, 89% of the water in the oceans and about 50% of the rocks. In the rocks it occurs combined, principally as quartz and

silicates, carbonates (chalk) and alumina. It is also an important constituent of all living tissue. Green plants produce it from carbon dioxide under the action of sunlight (see PLANTS: Physiology). Animals obtain their energy by the combustion of the foodstuffs in their tissues with the oxygen taken in through their lungs.

Oxygen was first described by J. Priestley in England in 1774 and was independently discovered by K. W. Scheele in Sweden in 1775. Stephen Hales had produced it in 1727 but had not recognized its elementary character. Lavoisier named it "oxygen" from two Greek words meaning "acid producing," thus recognizing the fact that most of the compounds of oxygen then known were acid in character.

Oxygen is usually prepared in the laboratory by heating a mixture of potassium chlorate and manganese dioxide, though there are a number of methods that can be used, among them the ELECTROLYSIS of water. Priestley obtained it by heating mercuric oxide. For preparing it on a commercial scale the old Brin process used barium oxide alternately heated in a vacuum and in a current of air. It has been largely superseded by the Linde process of fractional distillation of LIQUID AIR.

Chemically, oxygen is a member of the sixth group of the periodic table, together with sulphur, selenium and tellurium. Its maximum valency is six, but it is usually divalent. In the gaseous state there are two atoms of oxygen in each molecule. OZONE is an allotropic form of oxygen containing three atoms in each molecule. Oxygen is very reactive, combining directly with all the elements except the halogens and gold and platinum to form oxides. It forms compounds indirectly with all the elements except fluorine. It does not itself burn, but by combining with other elements it produces their combustion. Substances that burn in air do so much more vigorously in pure oxygen, and some substances, such as iron that do not burn in air, will do so in oxygen. It is this property of oxygen that makes the oxy-acetylene torch so effective in cutting iron and steel. (See METAL CUTTING; WELDING.)

Physiologically oxygen is the only gas that can support the RESPIRATION of living creatures. It is absorbed into the blood in the lungs of land animals and is dissolved in the water of the ocean from which fish absorb it through their gills. In the tissues of the body it is used to burn the food substances and maintain the body heat, and it is finally exhaled again combined as carbon dioxide and water. Deprived of oxygen all life ceases. Even the plants that produce oxygen from carbon dioxide in the daylight reverse the process in the dark and cannot live indefinitely without it. The few exceptions to this rule are some anaerobic BACTERIA such as those of tetanus and infectious gangrene and some intestinal parasites. Unlike combustion and contrary to popular belief the higher forms of life are not stimulated by an excess of oxygen in the air they breathe. Oxygen is administered in pneumonia to aid absorption from

the diseased lungs and to combat air-hunger, but not for any essentially stimulating effect. A mixture of oxygen with nitrous oxide is widely used for ANESTHESIA. A mixture of oxygen and carbon dioxide is used to resuscitate the victims of carbon monoxide ASPHYXIA. In this case the excess of oxygen displaces the monoxide from the blood more rapidly than if ordinary air were used and the carbon dioxide supplies the natural stimulus for deep breathing.

Oxygen has some antiseptic action in the nascent state, that is, just at the instant of its liberation from its compounds. Ozone and HYDROGEN PEROXIDE both liberate oxygen quite readily and the latter particularly is often used as an antiseptic. In large excess oxygen may act as an irritant poison and men or animals kept in an atmosphere of pure oxygen at several atmospheres pressure for more than a short time develop edema of the lungs.

M. C. H.

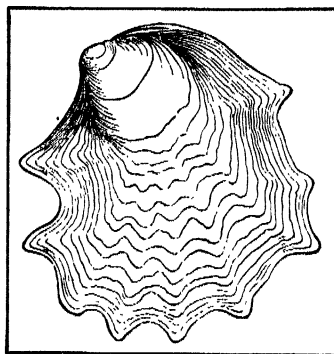
**OXYHYDROGEN FLAME**, a flame produced by the combustion of hydrogen with oxygen. This reaction is accompanied by a very high temperature, which varies with the proportion in which the two gases are combined, being highest when the volume of oxygen is twice that of the hydrogen, the ratio in which they unite to form water. Since a temperature in excess of 5000° F. can be obtained with the oxyhydrogen flame, it is of value commercially in the working of metals. By means of a blowpipe which brings jets of the hydrogen and oxygen together at its tip, a flame is produced which is effective in cutting and welding metals. The oxyhydrogen flame is being superseded by the oxy-acetylene flame. See also WELDING.

**OYAMA, IWAO, PRINCE** (1842-1916), Japanese Field Marshal, was born as a commoner at Satsuma. Although his elder brother joined the insurrectionists against the Emperor Meiji (see MEIJI TENNO) in 1877, Oyama remained loyal to the emperor and fought with distinction against the rebels. During the Sino-Japanese War he commanded the Second Army Corps that stormed Port Arthur, being rewarded for this service with the rank of Marquis and the title of Field Marshal. In the Russo-Japanese War he was the Commander-in-Chief of the Japanese armies in Manchuria. He died Dec. 12, 1916.

**OYSTER**, the popular name for many bivalve mollusks, *Lamellibranchia*, related to clams and mussels. The true oysters belong to one genus (*Ostrea*), but other bivalves, such as the pearl oyster, are commonly called by this name. There are about 100 species of true oysters found in shallow water on all sea coasts except in polar regions. They have heavy, irregular shells, whitish or grayish in color, with two valves or halves, joined by a hinge, which can be tightly closed by a strong muscle. The lower or left valve is heavier and more convex than the upper or right one. As adults oysters remain fixed to all sorts of objects—shells, rocks or timbers—and feed on microscopic plants and animals brought to them by the current.

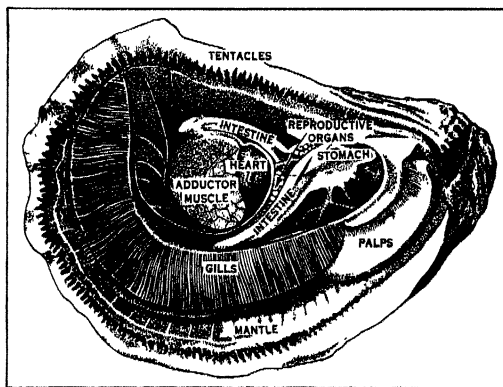
Among some oysters, such as the familiar American

species (*Ostrea virginica*), the sexes are separate, and the genital products are liberated in the water. As many as 60 million eggs may be produced in one season by a single female. In other cases, as in that of



YOUNG OYSTER  
*Ostrea virginica*

the European oyster (*Ostrea edulis*), the individual animal may be alternately male and female. Fewer eggs are produced by the European oyster, for the sperm is collected by the female, and fertilization takes



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ANATOMY OF THE OYSTER

place within the shell. The young do not leave the mother until they have reached the larval stage. All oysters pass through a free swimming larval period. They then settle down on some foreign body, lose their larval organs, and are known as "spat."

Oysters are among the most desirable of table delicacies, and oyster fisheries are important in many countries. The creatures are taken with dredges or rakes. A practice which is also gaining wide favor is the culture of oysters, either in natural beds, or in artificial ones. In oyster culture the animals are protected, as much as possible, from their natural enemies; a breeding stock is maintained; shells, branches and other objects are placed in appropriate places for the settlement of spat; and the full grown specimens are fattened, usually in special beds, before being sent to market.

In 1929 the total commercial catch of oysters in United States waters amounted to 152,143,000 lbs. with a value of \$17,074,000, mostly eastern oysters taken from Maine to the Gulf coast. Western oysters, 627,000 lbs. valued at \$367,000, and Japanese oysters, 66,000 lbs. valued at \$23,000, were taken in Pacific coast waters. See also OYSTER, PEARL. A. I. W.

**OYSTER, PEARL**, the popular name for members of a genus (*Margaritifera*) of bivalve mollusks, *Lamellibranchia*, related to scallops, and, less closely, to true oysters. Under certain circumstances they produce pearls. They are found in all tropical seas, but are fished for mainly in the Indian Ocean, the Persian Gulf, the South Pacific, and the Gulf of California.

The shell of a pearl oyster is made in three layers; the outer one is built of an organic substance, conchiolin; the middle is prismatic carbonate of lime, and the inner layer is mother-of-pearl, carbonate of lime laid down in such a way that it is beautifully iridescent. Pearls, which are secreted about irritating bodies, such as parasitic worms, sand grains, or bits of sea weed, within the oyster's shell and in contact with the epithelial cells of the mantle, are made of concentric layers of conchiolin and mother-of-pearl. See also PEARL.

**OYSTER BAY**, a village of southeastern New York, in Nassau Co. It is situated on a deep sheltered bay on the north shore of Long Island, about 30 mi. northeast of New York City. The Long Island Railroad, and in summer ferries to Greenwich, Stamford and New Rochelle serve the village. Oyster cultivation is the chief industry. The village is residential in character, with many large estates in the vicinity. "Sagamore Hill," the home of the late Theodore Roosevelt, with a charming view, is located in Oyster Bay and in 1928 a memorial park was dedicated to Roosevelt. Roosevelt is buried here, on a hillside in Youngs Memorial Cemetery. Oyster Bay was first settled in 1653. Pop. 1920, 20,296; 1930, 36,869.

**OYSTER CATCHER**, a genus (*Haematopus*) of large maritime shore birds allied to the plovers, with compressed, almost knife-like, bright red bills adapted for forcing open the shell fish upon which they feed. Oyster catchers vary from 16 to 21 in. in length and have very stout legs and feet. Usually their plumage is mostly black above and white below. They are found, commonly in small parties, on sandy seashores almost throughout the world, nesting in depressions in the sand and laying three spotted, buffy eggs. The North American species include the American oyster catcher (*H. palliatus*), which ranges from Virginia to Texas and southward to Patagonia, and the black oyster catcher (*H. bachmani*) and the Frazar oyster catcher (*H. frazari*) of the Pacific coast.

**OYSTER PLANT**, a name given to the common garden SALSIFY, the cooked root of which is fancied to possess an oyster-like texture and flavor.

**OYSTER-SHELL SCALE**, a European insect (*Lepidosaphes ulmi* or *Mytilapsis pomorum*) introduced into America late in the 18th century. It is perhaps the most widely spread species of its family (*Coccidæ*), being a pest from Canada to Mexico. It feeds on a great variety of woody plants, especially ash, lilac, apple, willow and maple. The male scale is almost microscopic. It has one pair of wings. It emerges from the scale and flies about for a few hours, at which time mating occurs. The insect passes the winter in the egg stage beneath the female scale. In the spring the young crawl to new locations, secrete scales and become fixed. Often they completely clothe and kill branches and even large trees. Winter spraying with lime sulphur solution will hold this pest in check.

**OZARKIAN PERIOD**, a new division of the PALEOZOIC ERA of geological history inserted by some authorities between the Cambrian and Ordovician periods, thus becoming the second earliest period of the era.

**OZARK MOUNTAINS**, a series of low mountains, extending in a generally southwest to northeast direction from northwestern Arkansas to east central Missouri, with foothills in Oklahoma, Kansas and Illinois. The highlands of this group are known collectively as the Ozark Plateau. The ridge of the Ozarks, believed by some geologists to be a severed branch of the Appalachian system, is prolonged south of the Arkansas River by the Ouachita Mountains. Numerous gorges and caves lend scenic interest to the Ozarks. The chief summits range in height from 1,500 ft. to 2,500 ft.

**OZONE**, an allotropic form of oxygen, having a peculiar dilute chlorine-like odor, noticed about electrical machines where a series of electric discharges occur in the air. It is a colorless and tasteless gas and condenses into a deep blue liquid which is fairly stable at temperatures below its melting point ( $-119^{\circ}\text{C}.$ ). The liquid gives off a deep blue vapor which explodes violently on a slight rise in temperature or on contact with organic or other oxidizable substance. Ozone decomposes slowly at low temperatures, rapidly at high temperatures and almost instantaneously at  $300^{\circ}\text{C}.$  It is a much more active oxidizing agent than oxygen and is effective in destroying bacteria. Its chief application is in the purification of drinking water and the air in crowded rooms. Ozone is produced commercially by the action of electrical discharges on air or oxygen.

**OZONIDES**, derivatives obtained by the action of OZONE on various classes of unsaturated organic compounds. Ozonides are generally thick oils or colorless syrups with an unpleasant choking smell. Most of them are explosive and they decompose readily in water. They have most of the characteristic properties of peroxides.

## P

**PACA**, a large, tailless Brazilian rodent (*Cuniculus paca*) allied to the caviés, called also spotted cavy. In form it resembles a large woodchuck, but is longer-legged and rich brown in color, ornamented with rows of white spots. Pacas are burrowers in low-lying ground, and are nocturnal in habits. In tropical districts where meat is scarce their flesh is an important food-resource. In Ecuador there is a smaller species which is alpine in habitat.

**PACH, WALTER** (1883- ), American painter and author, was born in New York City, July 11, 1883. He studied art in New York and Paris, opened a studio in New York, and has exhibited in Philadelphia, New York, Chicago and Paris. He has lectured at the Metropolitan Museum and at various universities. Pach is author of a number of books on art and the translator of Élie Faure's *History of Art*.

**PACHOMIUS, ST.**, Egyptian "Father of the Desert" and founder of monasteries, was born in upper Egypt during the 4th century. He lived as a hermit near Dendera by the Nile and founded a monastic order, one of the first of its kind, where monks or cenobites lived in common. Before he died there were nine of these monasteries. His friendship with St. Athanasius is worthy of note. Pachomius died about 346. His feast day is May 14.

**PACHUCA**, a city of Mexico, capital of the state of Hidalgo, situated in a cool climate 8,023 ft. above sea level, about 71 mi. northeast of Mexico City. Pachuca is the center of a very rich mining district. Many of the mines were worked before the discovery of America, and since 1534, when the first mine was discovered, they have been a source of wealth to both Spaniard and Mexican. Silver mines are especially important. One of the largest mines in the republic, Real del Monte, is 6 mi. distant. Pachuca is on three railroads, and, besides mining and smelting, engages in distilling and agriculture; wheat and other cereals, corn and maguey are produced. Pachuca was founded in 1534, and in 1537 Bartolome de Medina discovered the now superseded "patio" process of reducing silver ore with quicksilver here. Pop. 1921, 40,802; 1930, 46,659.

**PACIFIC, COLLEGE OF THE**, a coeducational institution at Stockton, Cal. It was founded in 1851 at Santa Clara, and was the first Protestant college of California. The institution was moved to San Jose in 1871, and to Stockton in 1922. The college is affiliated with the Methodist Episcopal Church, but is non-sectarian. The productive funds in 1931 totaled \$263,909. The library contained 26,000 volumes. In 1931-32 there were 715 students and a faculty of 57, headed by Pres. Tully C. Knoles.

**PACIFIC BLOCKADE**, a mode of redress short of war and nonamicable in character. The term is

a misnomer in international law because the term "blockade" applies to a well-known belligerent right, and the word "pacific" indicates a peaceful measure. The purpose of the pacific blockade is to induce governments refusing or delaying the adjustment of their claims to treat their settlement with respect. Germany in 1901 announced her intention to institute a pacific blockade against Venezuela, which would affect the ships of neutral powers. Upon protest of the United States that the blockade would not be pacific, Germany replied that the blockade would be warlike rather than pacific, but there would be no intent to declare war.

**PACIFIC GROVE**, a city in Monterey Co., western California, on Monterey Bay, 128 mi. south of San Francisco, served by bus lines and the Southern Pacific Railroad. Maddox Airport is five mi. from the city. Pacific Grove is a charming tourist resort, the site of which was discovered in 1542 by Juan Rodriguez Cabrillo. The city was founded in 1869. Tin cans are the chief manufacture. Pacific Grove is the seat of Hopkins Marine Laboratory, connected with Stanford University. The Methodist Church and the Y. W. C. A. hold large conferences at Pacific Grove. Pop. 1920, 2,974; 1930, 5,558.

**PACIFIC ISLANDS**, also Oceania, or Oceanica, a collective name applied to the three great divisions of islands in the Pacific Ocean, namely, Polynesia, Melanesia and Micronesia. Polynesia, in Greek meaning "many islands," covers the eastern part and comprises the Cook, Tuamotu, Society, Tubuai, Ellice, Phoenix, Manihiki and Marquesas groups, as well as Hawaii and a large number of smaller islands. Melanesia includes the islands in the western and south-central part of the Pacific, among which are the Fijis, the New Hebrides, the Solomons, the Loyalty islands, Santa Cruz, New Guinea and many lesser ones. Micronesia comprises the smallest division and embraces the Gilbert Islands, the Carolines, the Marianas, the Marshall group and Palau. See under separate names.

**PACIFIC OCEAN**, the largest body of water on the globe, bordered by Asia and Australia on the west and the Americas on the east. The north and south limits of its waters are respectively the southern limit of the Bering Sea, and a line joining the southern extremity of New Zealand and Cape Horn. Its area is estimated at 63,800,000 sq. mi. Along its western extent are tributary seas separated from the ocean by chains of islands. They include the Sea of Okhotsk beyond the Kuril Islands, the Japan and East China seas west of the Japanese Empire; the South China Sea beyond the Philippines and East Indies; and the Coral and Tasman seas between the ocean and Australia. The Equator divides the Pacific into north

and south div The southern is thickly studded with islands classified generally as the South Sea Islands and including the Fiji and Samoan groups. The northern part has the Hawaiian, Marianas and Caroline islands. They are generally the tops of hundreds of volcanic peaks arranged in chains along the crests of submarine mountain uplifts.

The average depth of the Pacific is 14,050 ft. but in places it is more than twice that deep. Depressions greater than 18,000 ft. are called Deeps, of which the Pacific has 32 in all. They occur along its outer periphery and include the Albatross Deep south of the Aleutian Islands, 24,012 ft.; the Nero Deep east of Guam, 31,614 ft.; the Penguin Deep east of the Kermadec Islands, 30,936 ft.; the Mindanao Deep east of the Philippines, 32,112 ft.; and the Tuscarora Deep east of Japan where a depth of 32,644 ft. was sounded and no bottom found.

The floor of the ocean has variations the same as does land although generally a less contrasting relief. The approach from the shore to the depths of the sea is made over a continental shelf which is conceded to be that part within a depth of 100 fathoms. This shelf varies in width and is comparatively narrow on the American side of the Pacific and wide on the opposite border, especially at Australia where coral formations create the Great Barrier Reef. The deposits on it are mostly materials derived from the land, whereas the floor of the sea is made up of red clay, various ooze and different kinds of mud.

The salinity of ocean water differs according to latitude but in the Pacific is nowhere over 36. Its tides are less pronounced than in the Atlantic and its chief currents are the north and south Equatorial and Japan. Cyclonic storms occur in the South Pacific between December and March but aside from these its waters are relatively peaceful. Its name originated with FERDINAND MAGELLAN who discovered it in 1540. Of its tributary rivers, the largest are the COLUMBIA and COLORADO in the United States and the AMUR and YANGTZE-KIANG in Asia.

**PACIFISM**, a term used to denote a movement which repudiates both MILITARISM and war in the conduct of international relations, and devotes itself to the advancement of world peace. An English Peace Society was formed as early as 1816; an American Peace Society in 1828. Permanent headquarters for the International Peace Movement were established at Bern in 1891. During the 19th century the movement gave its support chiefly to the development of international arbitration and the promotion of the peace conferences at The Hague. Since the close of the World War it has been primarily concerned with activities centering around the LEAGUE OF NATIONS.

**PACKARD, ALPHEUS SPRING** (1839-1905), American zoölogist, was born at Brunswick, Me., Feb. 19, 1839. He graduated from Bowdoin College in 1861, from the Maine Medical School in 1864, and finally studied under Louis AGASSIZ at Harvard. From 1867 to 1878 he was curator and director of the Peabody Academy of Science, Salem, Mass., and from

1878 until his death, professor of zoölogy and geology at Brown University, Providence. He was likewise State entomologist of Massachusetts from 1871 to 1877 and served on the U.S. Entomological Commission in 1882. Packard concentrated his attention upon the arthropoda, proposing several new classifications of these groups. He wrote widely upon zoölogy, publishing *Text Book of Entomology*, *Guide to the Study of Insects* and other books. In 1866 he founded and until 1886 edited the *American Naturalist*. Packard died at Providence, R.I., Feb. 14, 1905.

**PACKING PLANTS.** Though livestock have been raised for human food since primitive times, the establishment of packing plants is essentially a development of the last century. Prior to that time the slaughter of animals and sale of their meat were largely a local enterprise. But with the growth of the livestock industry of the United States in western and southwestern areas, remote from centers of population, there developed a need for transporting either the livestock or their meat long distances to consuming centers.

Experience soon showed the feasibility and economy of slaughtering animals in or reasonably near the areas of production and then distributing the fresh, dried, cured, or canned product. The advent of fast transportation and of modern refrigerating methods contributed materially to the growth of the meat packing industry.

The packing of beef in the United States began in Chicago in 1832 and subsequently was extended to Kansas City, Omaha, St. Louis, Sioux City, and about 60 other markets. With the growth of the swine industry in the Ohio Valley, it was found that hogs were even less able than cattle to endure long drives or shipment to market, especially in hot weather. Cincinnati early became an important pork packing center, and hogs are still slaughtered and packed principally in the Corn Belt States where they are produced.

With improvement in the construction and arrangement of packing plants and the development of machinery and conveyers for handling carcasses and large cuts of meat, the plants became highly efficient. Bones, tissues, glands, and other parts (*see MEAT BY-PRODUCTS*), formerly wasted, were converted into many useful products of commerce. Public sentiment in pure food and sanitation resulted, in 1906, in a rigid and comprehensive Federal meat inspection law, which caused further improvements in meat packing. Approximately 800 establishments, handling about two-thirds of the nation's meat supply, now operate under the Federal meat inspection system; the remaining third, by reason of its local or intra-state nature, is not subject to Federal supervision.

Through their large operations and well-organized systems of distribution, modern packing plants supply meat products throughout the United States and to foreign countries. Because of their large outlets, storage facilities and ample buying power, they also help to stabilize the livestock markets. Federal leg-

isolation, known as the Packers and Stockyards Act, enacted in 1921, provides for the supervision of certain phases of the packing business, particularly those affecting the welfare of livestock producers and the general public.

J. R. M.

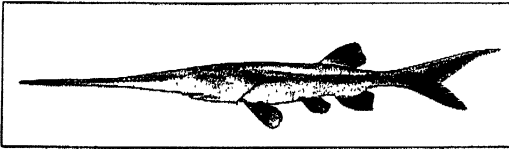
**PACK WALL**, in mining, a rock wall built without mortar, as GROUND SUPPORT in a mine. Mortar is omitted because it cannot stand the heavy pressure. The rock is usually obtained from roof or floor.

**PACOIMA DAM**, located on Pacoima Creek near San Fernando, Cal., is a concrete arch dam notable for its height of 375 feet above lowest foundation level and because its sole purpose is flood control. It is 366 feet high above the stream bed, has a maximum thickness of 96 feet at the base and is 560 feet long at top. It contains 215,000 cubic yards of concrete and a flood storage capacity of half a billion cubic feet.

**PACT OF PARIS.** See PARIS, PACT OF.

**PADANG**, a town of Sumatra, Dutch East Indies, seat of government of the West Coast residency of the island. The town is picturesquely situated on the shore and is the most important port of the section. The harbor is equipped with modern facilities for loading and unloading cargoes. Hides, rattans, copra, coal, coffee and quinine are the principal exports. Pop. 42,000.

**PADDLE FISH** (*Polyodon spathula*), called also spoonbill, a large fresh-water fish closely allied to the sturgeons, abundant in the rivers of the Mississippi Valley. It has a spindle-shaped body with a cartilaginous skeleton, smooth olive-colored skin, numerous long fine gill-rakers, and a heterocercal tail. While usually about 4 ft. long, the paddle fish sometimes



COURTESY AMERICAN MUSEUM OF NATURAL HISTORY  
CHINESE PADDLE FISH

attains a length of 6 ft. and a weight of 150 lbs. The remarkable snout, from which this fish derives its common name, terminates in a long spatula-like blade or paddle. This is used to stir up the mud when the fish searches for the small animals and plants upon which it feeds. The flesh of the paddle fish is sparingly used for food. See also STURGEON.

**PADDLE WHEELS**, wheels with boards or floats perpendicular to the circumference, driven by an engine to propel a vessel. For side wheel vessels as excursion boats and ferryboats for harbor service there is a paddle wheel on each side amidships, while stern wheel vessels, as those on the Mississippi River, have a large single wheel at the stern.

**PADERBORN**, a German city in the province of Westphalia, about 41 mi. east of Hamm. It is on the site where Charles the Great held his first diet after defeating the Saxons in 777; since 795 it has been the seat of a bishopric. Of a Romanesque

cathedral built there in 1143, the crypt and the massive tower are intact; the rest dates from the 13th century and contains many priceless antiquities and works of art. Nearby is the old St. Bartholomew's Church, built in 1009-26. The old university of the city, founded in 1616, has been replaced by the archiepiscopal academy of theology and philosophy. Paderborn was a Hanseatic city in 1614-19. Its industries include the manufacture of tobacco, glass, beer and soap; it has trade in livestock and grain. Pop. 1925, 33,719.

**PADEREWSKI, IGNAZ JAN** (1860- ), Polish pianist and composer, was born at Kurylowka, Nov. 6, 1860. He studied at the Warsaw Conservatorium, making his first concert-tour in 1876-77. In 1884, after studies under Urban and Wuerst in Berlin, he went to LESCHETIZKY at Vienna, from whom he acquired his extraordinary technique. He made his Paris and Vienna débuts in 1887. His first performances in the United States were in 1891. After his American tours of 1895-96 he founded the Paderewski Fund of \$10,000, to aid musical education in the United States. His opera *Manru* was successfully produced at Dresden in 1901. During the World War he worked indefatigably, giving concerts for Polish sufferers, and speaking on behalf of his country. In 1917, he organized a corps of Polish volunteers in the United States. After the Armistice he devoted himself to the formation of a Polish Republic, of which he was first premier in 1919, also acting as Poland's delegate to the League of Nations. His numerous compositions are marked by refinement and distinction, and his *Minuet in G* and *Legende* are universally popular. He has also written a concerto for piano and orchestra, songs and pianoforte pieces.

**PADUA** (Italian *Padova*), the capital of the province of the same name in northeastern Italy. It is the seat of a bishop, and lies in a garden-like plain about 20 mi. west of Venice. Parts of the encircling pinnaled wall of the medieval city and a few narrow, arcaded streets still remain. The center of the city is the Piazza dell' Erbe. On the Piazza del Santo is the bronze equestrian statue of the Condottiere Gattamelata, by DONATELLO, and on the Piazza Vittorio Emanuele II, numerous statues of famous Paduans. The most noteworthy church is that of Sant' Antonio, "Il Santo," an ungainly structure erected in the 13th century as the burial place of the city's patron saint. Other churches of interest are the Church of the Hermits, 1264; the Annunciata with frescoes by Giotto; the Cappella San Giorgio, 1377; the Scuola del Santo, an oratory built in 1430, with frescoes by Titian and his pupils; and the 16th century cathedral, with a 13th century baptistery near by. The principal secular buildings are the Palazzo della Ragione, 1172-1219; the Palazzo del Municipio; the Renaissance Loggia del Consiglio; and the University, 1493-1552, with a fine court. The famous university was founded 1222. There are other schools and academies, libraries, a museum with a picture gallery, and a botanical garden. Industry is negligible.



Padua was an ancient city called *Patavium* by the Romans. The capital of a county in the days of the Franks, it became in 1175 an independent city under mayors, of whom Ezzelino, 1237-1256, was perhaps the most tyrannical. After 1318 it fell under the Carrara, who lost it to Venice in 1405. It was Austrian for two periods, and united with Italy, 1866. Its importance in the Middle Ages and during the Renaissance was due to its university, which was one of the greatest centers of Italian learning. Pop. 1931, 131,066. *See also* PADUA CITY STATE.

**PADUA, UNIVERSITY OF**, at Padua, Italy, a university renowned in medieval times for its schools of law and medicine. It was founded in 1222 for a group of restless teachers and students who had emigrated from the UNIVERSITY OF BOLOGNA. Many of the students, still dissatisfied, moved on to Vercelli in 1228, but enough were left at Padua to maintain the university. Statutes, modeled after those of Bologna, were made in 1260, and in 1290 the strife between students and townspeople, occasioned by the latter's desire for new statutes, was settled. Pope Urban V added a faculty of theology to the university in 1363. The university acquired its first distinct building in 1390. Padua was particularly noted in the 14th-17th centuries for its teaching of Averroist Aristotelianism. The present university is well equipped with clinics, laboratories, an observatory, a library of over 200,000 volumes, a picture gallery, and the oldest botanical garden in Europe, 1545. It enrolls annually about 1,500 students. In 1930 the faculty of 231 was headed by Giannino Ferrari, Rector.

**PADUA CITY STATE**, one of the many independent city republics in Italy, established in the 11th century and enduring until the early 15th century. In 1405 Padua fell into the power of the republic of Venice and thereafter until 1797 was ruled by her. (*See* VENICE.) The republic in the 11th century came into immediate conflict with the neighboring republics of Venice and Vicenza. After a temporary weakening of their power due to the encroachments of powerful families of the D'Este type and their incidental submission to Emperor FREDERICK II in 1237, Padua regained its independence. Incidentally it was under the D'Este family in 1222 that the famous UNIVERSITY OF PADUA was founded, a university destined to become illustrious in the field of learning. Padua grew in prosperity for a half century until 1311, when for a period of seven years the city surrendered to the lord of Verona. For the balance of the 14th century Padua was ruled by the family of Carrara.

**PADUCAH**, a city and port of entry of southwestern Kentucky, the county seat of McCracken Co., situated at the junction of the Ohio and Tennessee rivers, about 175 mi. southeast of St. Louis, Mo. It is on four Federal highways and five railroads, steamship lines, bus lines and an airport provide transportation. Paducah has two traffic bridges, one across the Ohio and the other across the Tennessee River. The city is a railroad and distributing center for the sur-

rounding region, shipping large quantities of textile machinery and products, cordage, shoes, lumber, dairy products, tobacco, corn, fruits, iron ore, pork, vegetables and other commodities. Large railroad repair shops are located here. Its diversified manufacturing industries produced a total output valued approximately at \$16,000,000 in 1929; the retail business amounted to \$16,799,262. The first settlement was made in 1827. It was incorporated as a town in 1830, and a city charter was granted in 1856. Irvin S. Cobb was born in Paducah, which is the scene of many of his short stories. Pop. 1920, 24,735; 1930, 33,541.

**PAEONIUS**: (1) a Greek sculptor of the 5th century B.C., a native of Mendé in Thrace, an Ionian colony. On his *Floating Victory* appears: "Dedicated to Olympian Zeus by the Messenians and Naupactians as a tithe of the spoil of their enemies. Paeonius of Mendé made the statue, and he was a successful competitor in the construction of the gable-figures of the temple." The Niké or Victory was represented as floating down through the air. (2) An architect of Ephesus.

**PAESTUM**, an ancient city of Lucania, in Italy, about 5 mi. southeast of the River Silarus. Founded by Greek colonists from Sybaris, about 524 B.C., it was a flourishing city until the Lucanians captured it. About 274 B.C. the Romans settled a colony there, and from this time on it declined into insignificance. Paestum was taken by the Saracens in the 9th century and by the 16th century it was abandoned. Its ruins are interesting and well-preserved, among them the city walls, an amphitheater and two temples in Doric style to Ceres and Neptune and tombs. The modern Pesto is on the site.

**PAEZ, JOSÉ ANTONIO** (1790-1873), President of Venezuela, was born on June 13, 1790, in the Province of Barinas. He had practically no formal education. When 17 years old he worked as a peon and then as a cattle raiser in the llanos, where he came to know and lead the *llañeros*, the famous centaurs of the wars of independence. In 1810 he began to serve the republicans and from 1814 on won a series of campaigns culminating in the Battle of Carabobo in 1821, where he was made general-in-chief by Bolívar and was left in command when the latter went to Colombia.

In 1825 Paez was among those who suggested that Bolívar crown himself and establish a monarchy. Called to Bogotá in 1826 by Vice-President Santander to answer certain complaints, Paez refused and re-



THE NIKÉ (VICTORY) OF  
PAEONIUS (UNRESTORED)  
In the museum at Olympia,

volted. Two years later he became virtual dictator of Venezuela and in 1830 he declared Venezuela independent from Colombia and became constitutional president according to a new charter. Paez was tolerant and enlightened in his attitude towards the Church and economic problems. In 1838-43 he was re-elected and was President again in 1846 for a brief period, but was exiled to the United States in 1850. He returned, however, in 1861 and assumed the dictatorship, fought for two years, then resigned and handed the presidency to a compromise president. He took up his residence in New York City, where he died in 1873. P. V. S.

**PAGANINI, NICCOLO** (1784-1840), Italian violinist, was born at Genoa, Feb. 18, 1784. His father was his first teacher. After winning prizes at the Genoa Conservatoire he left home, becoming an easy dupe for swindlers. His passion for gambling and his endless love affairs kept him in perpetual difficulties. His cadaverous appearance and his many eccentricities, added to the brilliance of his performances, made him an exceedingly bizarre figure to the public. His technique, executed with a variety of new effects, and his real native artistry, brought him at every appearance a crescendo of applause. He died at Nice, May 27, 1840.

**PAGE, THOMAS NELSON** (1853-1922), American writer, was born in Hanover County, Va., Apr. 23, 1853. He was educated at Washington and Lee University, and received his law degree from the University of Virginia in 1874. Until 1893 he practiced law in Richmond, Va., then gave his time to writing and lecturing. In *Old Virginia*, his first and probably most popular collection of stories of the South before and during the Civil War, appeared in 1887. It contains perhaps his best tale, *Marse Chan*. *Red Rock*, 1898, and *Bred in the Bone*, 1904, are representative novels, while *The Old South*, 1892, and *The Old Dominion*, 1908, show Page's ability as an essayist. From 1913-18 he was American ambassador to Italy. He died in Oakland, Va., Nov. 1, 1922.

**PAGE, WALTER HINES** (1855-1918), American diplomat and editor, was born in Cary, N.C., Aug. 15, 1855. He graduated from Randolph-Macon College and took two years of graduate work at Johns Hopkins University. In 1887 he became manager of *The Forum*, and from 1890-95 was the editor. In 1895 he became associate editor of the *Atlantic Monthly* and in 1898 its editor. With Frank N. Doubleday he founded the publishing firm of Doubleday-Page & Co., in 1899, and a year later with himself as editor he established *World's Work*.

Page interested himself in many aspects of American social and economic life as a writer and editor and was generally regarded as a force in the shaping of public opinion. An admirer of Woodrow Wilson, he worked diligently for his election to the presidency in 1912 and in Mar. 1913 Wilson appointed him ambassador to Great Britain.

With the outbreak of the World War Page's post became of the utmost importance. He zealously de-

fended the rights of the United States as a neutral nation against Allied encroachments, and yet his numerous and lengthy despatches showed his sympathies with the Allies and his disapproval of the Central Powers. It has been contended that he shaped Wilson's opinions toward the United States entry into the war on the side of the Allied powers, and clearly it was a relief to Page when the United States took this course in 1917. Page's poor health compelled him to leave his arduous duties in Aug. 1918 when he returned to the United States. He died in Pinehurst, N.C., Dec. 22, 1918.

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**PAGEANT**, a community spectacle, presented in commemoration of some historical event. Originally used of the medieval MYSTERY PLAY (see also MASQUE), the word was applied to a form revived in England, first at Sherborne, Dorset, in 1905, and soon afterward in America. The modern pageant, employing choruses, group dances, special musical accompaniment, etc., may consist of tableaux or small integral dramas connected by a prologue, or of an elaborate procession. Outstanding pageants include: the Saint-Gaudens Pageant, by Percy MacKaye, given at Cornish, N.H., in 1905; Philadelphia Pageant in 1908; Hudson-Fulton Celebration, 1909; Lake Erie Celebration, 1913; St. Louis Pageant, 1914; "The Pilgrim Spirit," by George P. Baker, at Plymouth, Mass., 1920; Yorktown Pageant, 1931. The fruit and flower pageants of the West and South, and the New Orleans Mardi Gras should also be noted.

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**PAGET, SIR JAMES** (1814-1899), British surgeon, was born at Yarmouth, Jan. 11, 1814. He graduated from St. Bartholomew's Hospital, with which he was associated during his lifetime. He was appointed, in 1858, surgeon extraordinary to Queen Victoria and in 1863 surgeon in ordinary to the Prince of Wales. He was Hunterian orator in 1877, and president of the International Medical Congress, and in 1833 vice-chancellor of the University of London. Paget specialized in pathology of tumors and diseases of bones and joints. His best works are his *Lectures on Tumors* (1851), *Surgical Pathology* (1863), *Clinical Lectures and Essays* (1875), the catalogue of the Pathological Museum of the Royal College of Surgeons (1882), of which he was president in 1875, and his original descriptions of eczema of the nipple with subsequent mammary cancer (1874) and osteitis deformans (inflammation of the bone with distortion of the bones affected). He died in London on Dec. 30, 1899. M. F.

**PAGLIACCI**, an opera in two acts, music and libretto by RUGGIERO LEONCAVALLO; première, Milan, 1892, New York, 1893. Although Leoncavallo composed several other operas, this is the only one that has been widely successful. Its success has been such that only half a dozen operas in the last fifty years may be said to vie with it in general favor.

Canio, master of a troupe of strolling players or *pagliacci*, discovers that his wife, Nedda, has a lover. Coming upon the latter, whose name is Silvio, Canio rushes at him with a dagger. When the lover escapes, Canio turns upon Nedda, demanding to know the man's name. Nedda refuses to reveal it. Tonio, in a rage against Nedda for her refusal to consider his own advances, takes malicious delight in whetting Canio's hunger for vengeance. That night during the play he whispers to Canio that Nedda's lover surely will be there, and that a glance from Nedda will betray him. So her husband decides to bide his time until the performance which, as it so happens, is concerned with the fury of a jealous husband. At first, as the play advances, Canio is merely the actor; but pent within him is the anguished emotion which is apparent as he, in the rôle of Pagliaccio, questions Nedda in her own rôle of Columbine. He becomes more menacing with each question while the audience, save for Silvio, is enraptured by the realism of the actors. But Nedda cannot stem the tide of her husband's passion. "Pagliaccio! Pagliaccio!" she cries, reminding him of the part he is portraying. "Ridi, Pagliaccio!" he declaims, beside himself. "I am Pagliaccio no longer! Name your lover!" The audience at last is genuinely frightened. Silvio rises from his seat in perturbation. Nedda, no longer Columbine, attempts flight. But Canio catches up with her, a dagger in his hand, and stabs her. "Take that," he shouts, "perhaps you will name your lover in your death agony!" The dying woman does so, gasping out the words, "Help, Silvio!" Instantly Silvio leaps to her side, to be struck down with the same weapon that slew Nedda. "Ridi, Pagliaccio," wails the orchestra as Canio, the knife fallen from his hand, stands stupefied over the scene of his slaughter.

**PAGOPAGO**, also Pango-Pango, chief port of TUTUILA ISLAND, American Samoa. The harbor of Pagopago penetrates the coast of the island like a fiord and is the only good harbor of American Samoa. Copra is exported, but interest in the port is due chiefly to the fact that it is a United States naval station.

**PAHANG**, one of the Federated Malay States under British protection. It extends along the eastern coast of the MALAY PENINSULA and embraces an area of 14,000 sq. mi., being the largest in territory of the Malay States. The surface is largely covered with forests and whatever cleared is well-adapted to agriculture. The produce include gold, lead, tin, rubber and rattans. Kauntan is the chief port and Pekan the official capital, though the sultan resides farther inland. Pop. 1921, 146,064.

**PAHLAVI** or **MIDDLE PERSIAN**, an extinct language of the West Iranian division of the INDO-IRANIAN group of the INDO-EUROPEAN linguistic family, being Persian in its transition from Old to Modern Persian, and its grammatical structure being that of the latter. Its earliest known document is a papyrus from Avraman (13-12 B.C.), and besides inscriptions, it is the vehicle of an extensive literature,

chiefly concerning Zoroastrianism and MANICHAISM. The inscriptions show two dialects, Parsik (PERSIAN) and Pahlavik (PARTHIAN), differing more in phonology than in morphology. The former was employed by the Sasanians in the south of Persia, the latter by the Arsacids in the north. The language is written in scripts borrowed from ARAMAIC, but in the Pahlavi of the manuscripts the readings are rendered excessively obscure by the use of logograms written as SEMITIC, but read as Iranian (e.g., the word for "king" is written *malkâ*, but read *shâh*, somewhat as, in English, *£* or *tē*, for Latin *libra* is read "pound").

L. H. G.

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**PAIN.** Pain is physical and mental suffering. The pain sense is probably the most widely distributed sense in the body. It is present throughout the skin, and under certain conditions may be aroused by the stimulation of nerves in the internal organs, as well as those in the membranes lining the chest and abdominal cavities.

The experimental evidence seems to be in favor of the theory that there is a special set of nerve fibers that carry the pain sensation. The physiological knowledge concerning this sense is limited chiefly to the skin. It seems that in the skin there are numerous "pain points." The amount of stimulation necessary to produce pain varies in different parts of the body. The front part of the eyeball, known as the cornea, gives sensations of pain with much weaker stimuli than do the finger-tips. In general, a greater stimulation is required to produce the sensation of pain than that of pressure.

Examination of the pain points under the microscope shows that there is no special end organ for the sense of pain, but the stimuli that produce pain act upon the free endings of the nerve fibers in the skin.

Any artificial stimulus, such as pressure, heat or cold, may affect these nerve endings if the stimuli are of sufficient intensity. Inflammation along the course of a nerve will produce very much pain, probably as the result of pressure upon the nerve.

Under normal conditions an individual is able to tell fairly definitely, following a painful stimulation of the skin, just what point has been stimulated. Pain arising in the deep organs, however, is localized more inaccurately. For example, the pain coming from a toothache may be felt in the entire side of the face. Such pains, coming from the internal organs are often referred to points on the skin, and there may even be tenderness in these skin areas. Such pains are called reflected pains. The pain is referred to the skin region that is supplied from that part of the spinal cord which supplies the internal organ which has been stimulated. The misreference of the pain is due to diffusion in the nerve centers.

The sensations of pain are probably received in

PAINTER-ENGRAVER

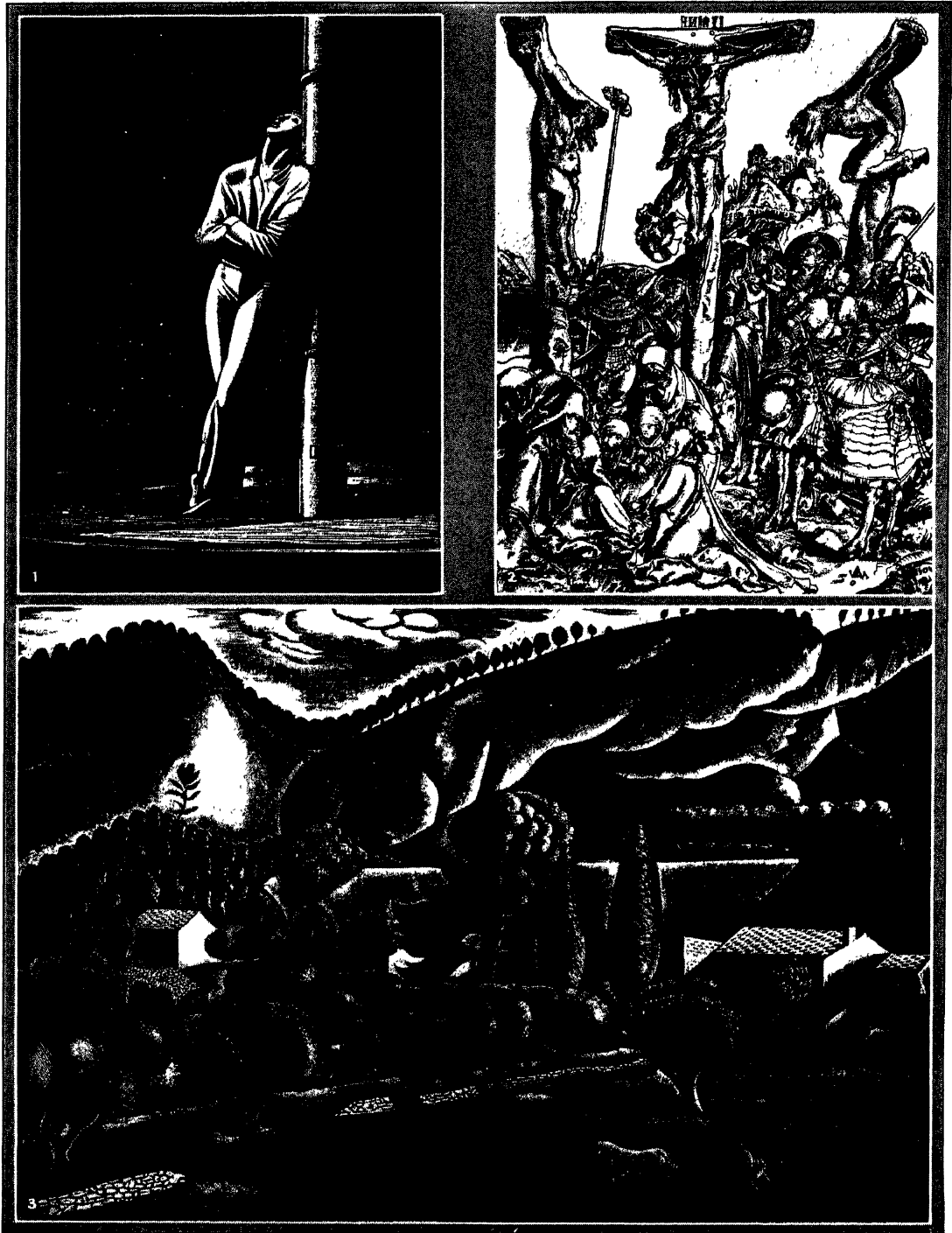


COURTESY METROPOLITAN MUSEUM OF ART

“THE FLIGHT INTO EGYPT”

An engraving by Martin Schongauer (1446?-88?), one of the greatest masters of the art.

# PAINTER-ENGRAVER



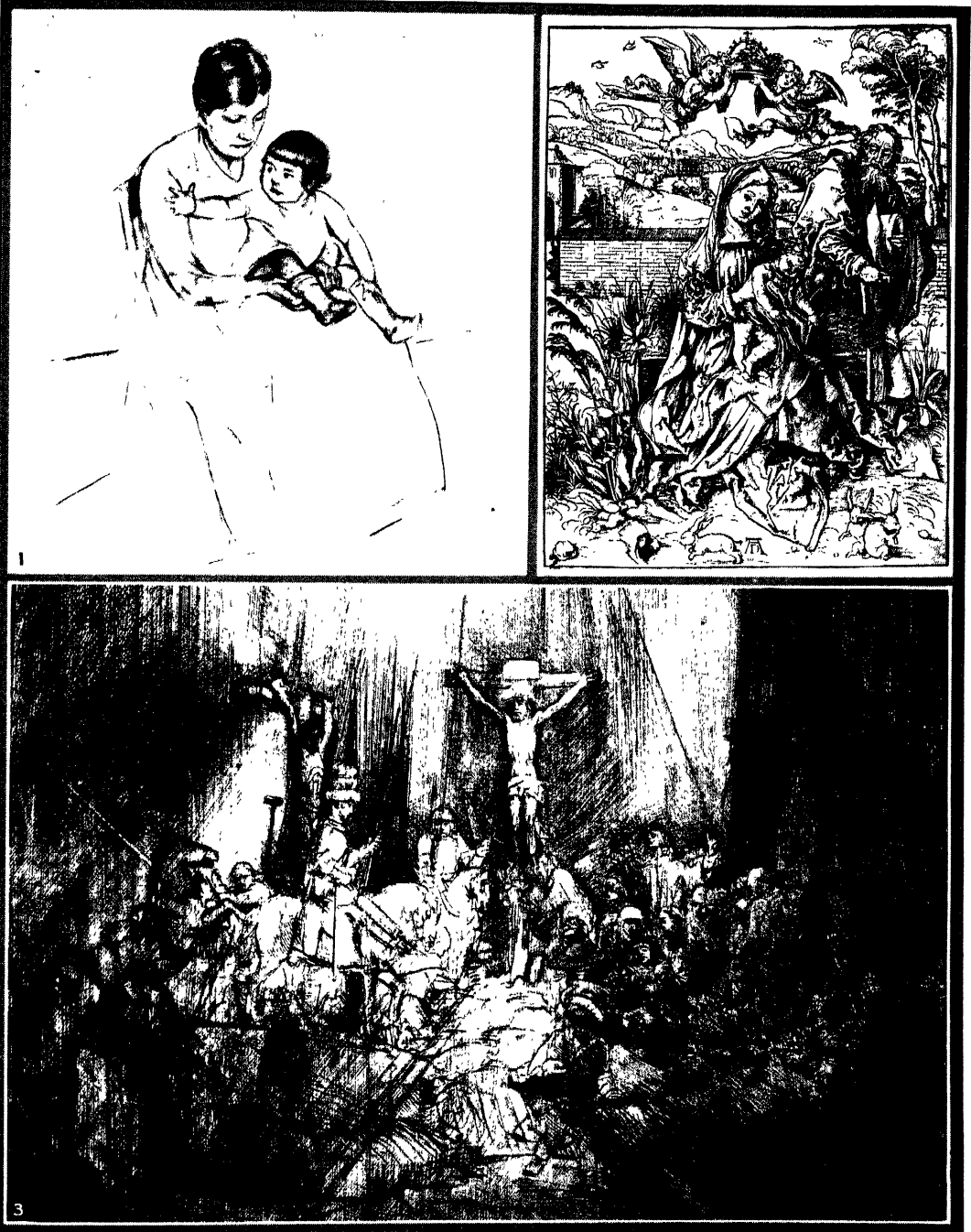
1. BY WEYHE GALLERY, NEW YORK; 2, 3. METROPOLITAN MUSEUM OF ART

## WOODCUTS BY AMERICAN, FRENCH AND GERMAN MASTERS

1. American 20th century: "Man at the Mast," by Rockwell Kent (1882- ). 2. German 16th century: "The

Crucifixion," by Lucas Cranach (1472-1553). 3. French 20th century: "Paysage," by Demetrius Galanus (1882- ).

## PAINTER-ETCHER

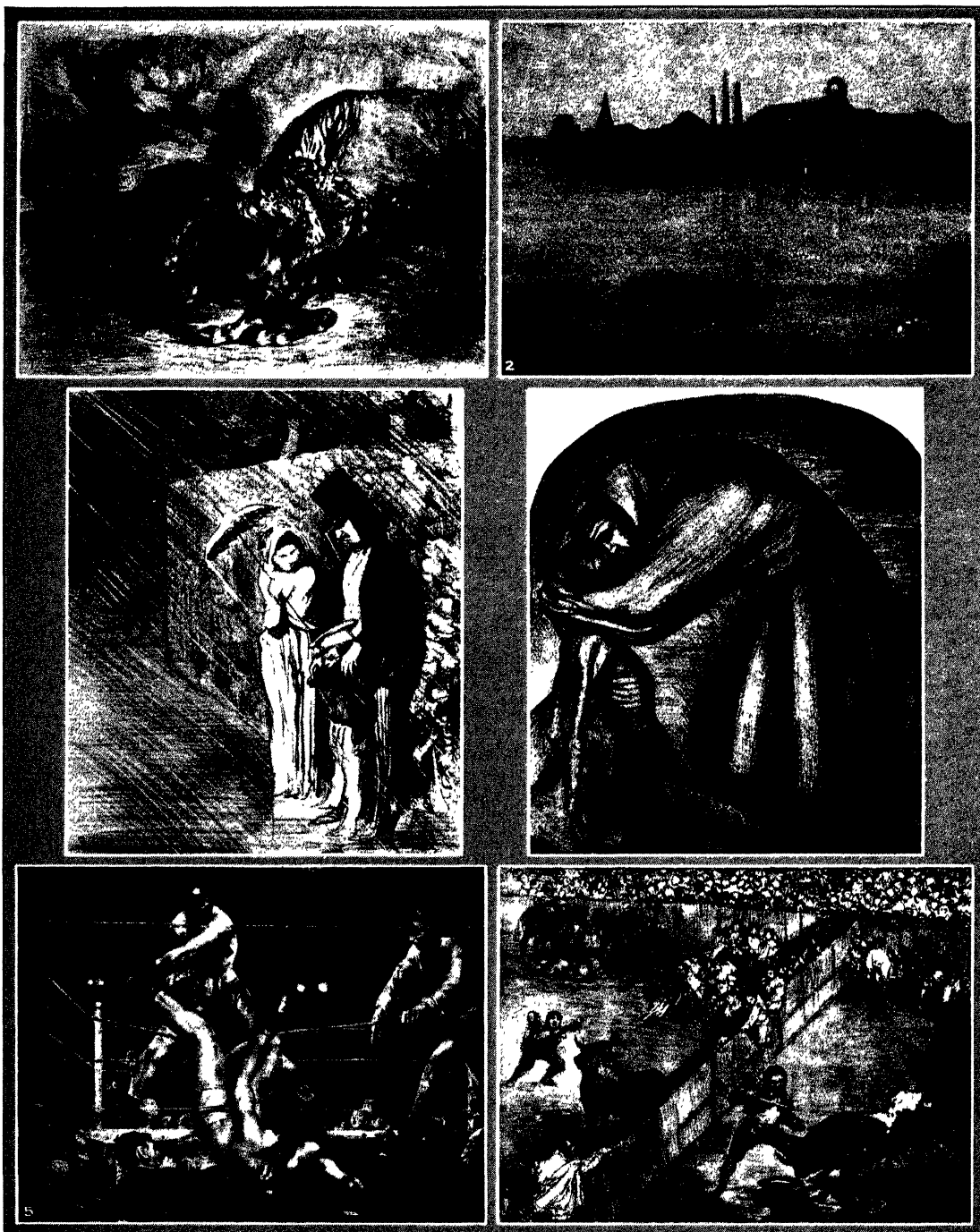


COURTESY METROPOLITAN MUSEUM OF ART

### DRYPOINT ETCHING AND WOODCUTTING

1. "The Stocking," a drypoint by Mary Cassatt (1855-1926). 2. "The Holy Family, With Three Hares," a woodcut by Albrecht Dürer (1471-1528). 3. "The Three Crosses," a drypoint by Rembrandt van Ryn (1607-69).

## PAINTER-LITHOGRAPHER



1, 2, 3, 5, 6. COURTESY METROPOLITAN MUSEUM OF ART; 4. DELPHIC STUDIOS

### LITHOGRAPHS BY AMERICAN AND EUROPEAN ARTISTS

1. "Tiger Attacking a Wild Horse," by Eugène Delacroix (1798-1863). 2. "Nocturne," a typical example of the artist's style in treating twilight scenes, by James Abbott McNeill Whistler (1834-1903). 3. "Strangers in Paris," by

Honoré Daumier (1808-79). 4. "The Franciscan," by José Clemente Orozco (1883- ). 5. "Dempsey and Firpo," by George Bellows (1882-1925). 6. "The Divided Arena," by Francisco Goya (1746-1828).

two parts of the brain, known as the optic thalamus and the cerebral cortex.

Conditions affecting the lining membranes of the chest and abdominal cavities do not cause reflected pain or tender areas in the skin.

When, for some reason, the sensation of pain is depressed in an area of the skin, stimulation in this region may give sensations of pain that are referred to the symmetrical area on the opposite side of the body.

W. I. F.

**PAINE, ALBERT BIGELOW** (1861- ), American author, was born in New Bedford, Mass., July 10, 1861. He was educated in the public schools of Xenia, Ill. From 1899 to 1909 he was editor of *St. Nicholas Magazine*, and published many books for children. He was the friend and literary executive of MARK TWAIN and published *A Boy's Life of Mark Twain*, *Mark Twain, a Biography*, 1912, *Mark Twain's Letters*, 1917, and *A Short Life of Mark Twain*, 1920. *Jan, the Romantic* appeared in 1929. In 1928 France made Paine a Chevalier of the Legion of Honor.

**PAINE, JOHN KNOWLES** (1839-1906), American organist and composer, was born at Portland, Me., Jan. 9, 1839. In 1858 he entered the Berlin Hochschule, and on his return to the United States he had marked success as a concert organist. In 1862 he was appointed instructor, and later first professor of music at Harvard, occupying the first chair of music in an American university. He composed numerous cantatas and symphonic poems. Paine died at Cambridge, Mass., Apr. 25, 1906.

**PAINE, ROBERT TREAT** (1731-1814), American lawyer and patriot, was born at Boston, Mass., on Mar. 11, 1731, and graduated in 1749 at Harvard. Later he studied law, and in 1770 conducted the prosecution of Capt. Preston and his men for their part in the Boston Massacre. A Federalist, from 1774 to 1778 he represented Massachusetts in the first and second Continental Congresses, and signed the Declaration of Independence. He helped to draft a new constitution for Massachusetts in 1780, and from that year until 1790 he was attorney-general for the state. In 1790-1804 he served as associate justice of the Massachusetts supreme court. Died at Boston on May 11, 1814.

**PAINE, THOMAS** (1737-1809), American political writer and pamphleteer, was born in Thetford, Norfolkshire, England, the son of a Quaker. He received little formal education, pursued various occupations without success, and his life really began only in 1774, when he met BENJAMIN FRANKLIN in London and was encouraged by him to go to America. He sailed the same year, and from 1774-76 was assistant editor of the *Pennsylvania Magazine*. Paine quickly became a fervent advocate of American liberty. In Jan. 1776 he brought out *Common Sense*, a brilliant, slashing pamphlet intended to arouse America to revolt against English oppression. More than 100,000 copies of it were circulated within three months.

Paine's next work for the American cause was his

series of exhortatory political tracts entitled *The Crisis*, the first number of which began with the unforgettable words, "These are the times that try men's souls." The tracts did much to keep up the American morale throughout the Revolution.

From 1787-1802 Paine led a harried life in France and England. He worked with characteristic fearlessness and zeal for the French Revolution. He sat in the assembly which convicted King Louis XVI; several times he was imprisoned. In England he strove against Pitt and EDMUND BURKE, and as a retort to the latter's *Reflections on the Revolution in France* published the impassioned *Rights of Man* in 1791. Outlawed from England in 1792, he returned for a time to France. His last conspicuous work was *The Age of Reason*, 1794-95, an eloquent attack on religion which revealed Paine as a brilliant if rather crude literalist. The revolutionary's last years were bitter. He returned to America in 1802, but his former glory was gone. Deserted by his old friends, neglected and in poverty, Paine died in New York City, June 8, 1809.

**BIBLIOGRAPHY.**—M. D. Conway, *The Life of Thomas Paine*, 1892; Ellory Sedgwick, *Thomas Paine*, 1897; Mary A. Best, *Thomas Paine, Prophet and Martyr of Democracy*, 1927.

**PAINESVILLE**, a city in northeastern Ohio, the county seat of Lake Co. It is situated on the Grand River, 3 mi. from Lake Erie and 30 mi. northeast of Cleveland. Motor buses and four railroads serve the city. There is a government emergency airport. The city has various manufactures, including veneer woodcutting machines, electric refrigerators and chemicals. Painesville is the center of a large nursery industry. Lake Erie College for girls is located here. The site was settled by Gen. Champion in 1805 and named for an officer of the American Revolution, Gen. Edward Paine. The village was incorporated in 1832, the city in 1902; Painesville has the city manager form of government. Pop. 1920, 7,272; 1930, 10,944.

**PAINLEVÉ, PAUL** (1863- ), French statesman and mathematician, was born at Paris, Dec. 5, 1863. He attended the École Normale Supérieure, obtaining there his doctorate in mathematics. His interest in politics grew from the time of the DREYFUS affair, when he definitely took sides for the republic and free-thinking as against the monarchy and Catholicism. Elected to the Chamber of Deputies for Paris in 1906 as an independent socialist, he specialized in matters pertaining to the army and navy. In 1915 he became a member of ARISTIDE BRIAND's cabinet as Minister of Public Instruction and of Inventions. Painlevé resigned nearly a year later after a disagreement with Briand on the conduct of the war, but was soon again Minister of War in Ribot's cabinet of March 1917. He was responsible for the appointment of Pétain in place of Nivelle as commander-in-chief of the French armies, and formed his own cabinet on September 12 of the same year. Painlevé had worked for the inclusion of the socialists in his cabinet, but their demands for peace-negotiations weakened his



following in the chamber and forced his resignation on Oct. 19, 1917. A reconstructed cabinet gave him the support of the Centre. Painlevé was indirectly responsible for Foch's ultimate appointment as supreme commander of the Allied troops. Once again, the matter of peace and defeatism threatened Painlevé's strength in the Chamber and on Nov. 13, 1917 he was succeeded by CLEMENCEAU.

Immediately after the War, Painlevé remained for a time in the obscurity cast over French liberal politics by the aggressive nationalism of the victory period. He helped the Socialist leader, EDOUARD HERRIOT, win a victory at the polls on May 11, 1924. Painlevé became President of the Chamber of Deputies. When, after the election of Gaston Doumergue to the Presidency, Herriot failed to command the support of the chamber on his financial measures, Painlevé formed a cabinet with himself in the War Office. During his tenure the Moroccan revolt occupied his attention and he went to the scene of battle where he had sent Pétain in charge. CAILLAUX's financial proposals being rejected by the Chamber, Painlevé tried his own skill at the post only to be ousted on Nov. 21, 1925. Since that time he has been Minister of War four times.

Among his political writings are: *Comment j'ai nommé Foch et Pétain*, 1923, and numerous books and addresses on the army and the air force. His principal contributions to mathematical science are: *Leçons sur le frottement*, 1895; *Leçons sur la théorie analytique des équations différentielles*, 1897; *Existence de l'intégrale générale*, 1910.

**PAINT**, a fluid consisting of finely ground **PIGMENTS** suspended in a liquid. The pigment usually comprises 25 to 30% by weight of the finished paint. The best known pigments are white lead, zinc oxide, lithopone, titanium oxide and basic lead sulphate; native earth-iron oxides, red oxide of iron, red lead, orange mineral, chrome yellow, chrome green, ultramarine blue, prussian blue, and lampblack. In addition, many pigments are extended with inert fillers, such as barium sulphate, china clay, whiting and silica.

The liquid consists of a drying oil such as **LINSEED OIL**, a volatile thinner (turpentine or petroleum spirits) and a small amount of drier. Following the application of the paint, the thinner evaporates, leaving a film of oil and pigment. The oil in drying absorbs oxygen from the air forming a tough leathery film which binds the pigment particles firmly to the surface protected; the pigment plays an important part, however, because without it the film of oil soon disintegrates. Heavy bodied oil or varnishes containing gums may instead be used in paints. The resulting products are called enamels; lacquers usually contain nitrocellulose with suitable solvents.

Painting as a decorative art goes back to early times, while its use for protective purposes is a comparatively modern development. The principal requirements for the latter are hiding power and durability. These are met in the product by the properties of opacity of

the pigment in the oil medium and elasticity of the paint film after it is applied. **WHITE LEAD** has good hiding power and great durability, and is extensively used alone or in substantial mixtures with certain other pigments, for outdoor painting; **LITHOPONE** and zinc oxide find use principally in interior work, red lead on structural steel. Titanium oxide paints are rapidly gaining favor on account of their remarkable hiding power, which is greater than that of any other white pigment. G. W. T.

**BIBLIOGRAPHY.**—Sabin, *Technology of Paint and Varnish*; Heaton, *Outlines of Paint Technology*; Toch, *Chemistry of Paints*.

**PAINTED DESERT**, a region of plateau and mesas in north central Arizona, famous for the brilliancy of its coloring. The desert begins at the head of the Marble Canyon of the Colorado and extends southeastward along the east side of the Little Colorado River for about 100 mi. It ends just a short distance south of the Santa Fé railroad which crosses it between Holbrook and Winslow. The width of the desert varies between 15 and 40 mi. It lies at an altitude of 500 ft. The climate is exceedingly dry with the result that there is but little vegetation to detract from the vivid reds, pinks, purples, browns, blues, grays and white of the Triassic sandstone, shale and clay which form the region.

A petrified forest of the Mesozoic time, the most remarkable in the United States, lies within the desert. Indications of volcanic action and traces of lava flows are numerous. Seven Hopi Villages, of which Walpi and Oraibi are best known, are picturesquely situated on colorful mesas and cliffs about 60 mi. north of Winslow. The National Park-to-Park Highway crosses the southern edge and from it roads lead up into the desert.

**PAINTER, WILLIAM** (c. 1540-94), English translator, was born probably in Middlesex, about 1540, and educated at Oxford. His chief accomplishment was the translation of some 100 stories from the Latin, Greek, French and Italian, published in 1566-67 as *The Palace of Pleasure*. This work introduced BOCCACCIO, BANDELLO, and other foreign writers to English readers. Painter died in 1594.

**PAINTER-ENGRAVER**, an artist who uses engraving as a medium of expression for his original compositions and designs or who expresses his creative ability through some form of engraving, as distinguished from the professional engraver who reproduces the work of others. The term painter-engraver comes from the French *peintre-graveur*. ALBRECHT DÜRER was the first great master of engraving who used the art as a direct medium of expression. Dürer, who also engraved on copper and in line, was one of the greatest of all makers of woodblock prints. The most famous of his woodcuts is the *Four Horsemen of the Apocalypse*. Other outstanding painter-engravers are REMBRANDT and J. M. WHISTLER, who were master etchers; J. M. W. TURNER, who expressed himself in MEZZOTINT; and Ferdinand Gaillard (1834-87), who worked in line.

Lucas Van Leyden (1494-1533) produced plates of great originality and beauty of design. Marcantonio Raimondi (c. 1480-c. 1534), an Italian painter, is credited with being the first to draw attention from creative engraving to reproduction by engraving of paintings already created.

**PAINTER-ETCHER**, an artist who etches his own designs, as distinguished from the etcher who reproduces the work of others. The painter-etcher as a rule uses only the needle and *aqua fortis* for his results, which are readily distinguished from the mechanical arrangement of lines made by the line engraver. ALBRECHT DÜRER, a German, and two Italians, Domenico Veneziano (c. 1390-1461) and Fran-



BILIBALDI·PIRKEYMHERRI·EFFIGIES  
·AETATIS·SVAE·ANNO·L·III·  
·VIVITVR·INGENIO·CAETERA·MORTIS·  
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·M·D·XX·IV· A

COURTESY METROPOLITAN MUSEUM OF ART

PORTRAIT ETCHING DESIGNED BY ALBRECHT DÜRER FOR THE  
BOOKPLATE OF WILLIBALD PIRCKHEIMER

cesco Parmigiano (1504-40) are the first artists known to have practised ETCHING. REMBRANDT, the first great master of etching, has never been equalled in the medium. After falling into disuse for some time, ETCHING was revived in England by J. M. TURNER, who used the art as a foundation for MEZZOTINT. In its revival, etching reached its highest point in the work of Sir Francis S. Haden (1818-1914) in England, in J. M. WHISTLER in the United States and in

Charles Meryon (1821-68) in France. Of the latter-day etchers, Zorn, Brangwyn, and JOSEPH PENNELL (1860-1926) rank high. The first etching executed by a painter in America is thought to be a portrait of Washington done in 1790 by Joseph Wright. Little important etching was done in the United States until the latter half of the 19th century when the works of painter-etchers began to win appreciation.

**PAINTER-LITHOGRAPHER.** The resources of LITHOGRAPHY as an original art were explored during the first half of the 19th century, especially in France, where painters like J. A. Géricault (1791-1824), EUGÈNE DELACROIX and the Barbizon artists demonstrated the power of the grease crayon to render rich shadow and subtle suggestions of color. The period produced master lithographers, among them Eugène Isabey (1804-86), Honoré Daumier, Adolf Menzel (1815-1905), FRANCISCO GOYA in Spain, and the English Richard P. Bonington (1801-28). With the rise of commercial lithography in the 50's, artistic interest flagged.

In the United States most of the early signed portrait and scenic lithography lacked true painter quality. Thomas Moran (1837-1926), JOHN LA FARGE and WILLIAM MORRIS HUNT did original work on stone, the latter compassing silvery tones and resonant blacks worthy of the medium.

In the "revival" of the late 70's, led in Germany by Menzel, in France by Henri Fantin-Latour (1836-1904), the expatriate American, J. M. WHISTLER headed the English movement. Other Americans working in this medium abroad included JOSEPH PENNELL, J. S. SARGENT, ALBERT STERNER, MARY CASSATT and J. McClure Hamilton (1853- ). Whistler's sensitive, spontaneous crayon-sketches suggested fresh technical possibilities, and eventually revived American interest in lithography. To the highly individualistic and experimental modern movement, at its height in Germany and France, the United States contributes the masterly lithographs of GEORGE BELLows and ARTHUR DAVIES, and the works of Bolton Brown (1864- ), ROCKWELL KENT, Charles Locke (1899- ) and others.

**PAINTING: Movements and Schools.** See the following: LANDSCAPE PAINTING IN AMERICA; WATER COLOR PAINTING; BARBIZON SCHOOL OF PAINTING; BOLOGNESE SCHOOL OF PAINTING; CLASSICISM; CUBISM; DADAISM; DÜSSELDORF SCHOOL OF PAINTING; DUTCH SCHOOL OF PAINTING; ECLECTICISM; EXPRESSIONISM; FAUVISM; FERRARESE SCHOOL OF PAINTING; FLORENTINE SCHOOL OF PAINTING; HUDSON RIVER SCHOOL OF PAINTING; IMPRESSIONISM; ITALIAN PRIMITIVES; LOMBARD SCHOOL OF PAINTING; LUMINISM; MURAL PAINTING IN AMERICA; PORTRAIT PAINTING; POST-IMPRESSIONISM; PRE-RAPHAELITISM; REALISM; ROMANTICISM; SIENESE SCHOOL OF PAINTING; SURREALISM; UMBRIAN SCHOOL OF PAINTING; VENETIAN SCHOOL OF PAINTING.

**PAINTING: Types.** See ENCAUSTIC PAINTING; FRESCO; GENRE PAINTING; PASTEL; TEMPERA.

**PAINTING: Types of American Painting.** See HUDSON RIVER SCHOOL OF PAINTING; LANDSCAPE

PAINTING IN AMERICA; MINIATURE PAINTING IN AMERICA; MURAL PAINTING IN AMERICA; PORTRAIT PAINTING; STILL LIFE PAINTING IN AMERICA; WATER COLOR PAINTING.

**PAINT VEHICLES**, medias used in painting for carrying, drying and protecting pigments. The most common vehicle is a mixture of raw and boiled LINSEED OIL, the boiled oil being used to accelerate drying. A paint vehicle may be a mixture of raw and boiled oils thinned with turpentine, white spirits, naphtha or some other volatile solvent; it may consist of a resin or gum varnish, or a mixture of both, with or without linseed oil. The chief oils used as vehicles are linseed, poppy seed, tung, soya bean, pirella, sunflower seed, and menhaden.

**PAISLEY**, the largest town in Renfrewshire, Scotland, situated about 7 mi. south of Glasgow, on the White Cart, 3 mi. from its confluence with the Clyde. The older section is now the industrial district and the newer portion, dating from late 18th century and occupying the grounds of a 12th century abbey, has handsome public buildings and works. The remains of the Abbey church, largely of the 14th century, are well preserved, and in the precincts is a memorial to Alexander Wilson, the American ornithologist, born at Paisley in 1766. The river dividing the town has been deepened, and carries a considerable traffic which, with engineering works, some shipbuilding, chemical and thread manufactures, and founding, make the town an important industrial center. The manufacture of Paisley shawls, once so famous, has almost died out. Pop. 1921, 84,837; 1931, 86,441.

**PAIUTE**, a name involved in great confusion which has been applied loosely to small Shoshonean tribes in western Utah, northern Arizona, southern Idaho, eastern Oregon, Nevada, and eastern and southern California. Powell, who took a census of the bands in 1873, states that the name belongs exclusively to the Corn Creek tribe of southwestern Utah. But the name is now generally used to designate Shoshonean tribes occupying southwestern Utah, southwestern Nevada and northwestern Arizona. The Paiute are a healthy, peaceable and industrious people and are widely employed as workers by white farmers.

**PALACE**, primarily the name given to the residence of a king. The term is also applied in England, France and Spain to the house of a bishop; in France, to the seat of certain public activities, such as the courts of justice; and in Italy to both a public building and an important town mansion. In feudal days the residence of the French *seigneur* within the castle fortifications was known as the *palais*.

The imperial residence on the Palatine Hill in Rome, begun by Augustus and added to by his successors, was called the *Palatium*, and gives its name to the modern word, *palace*, *palazzo*, *palais*, *palast*. This is still to be seen, as are several other Roman palaces. Little Byzantine or Romanesque work of this type remains. The greatest palaces of the Gothic period in Italy are the ducal palace in Venice and the

Bargello and Palazzo Vecchio in Florence. Noteworthy Gothic examples in France are the Palace of the Popes at Avignon and the Palais de Justice in Rouen. Some of the most celebrated of the many great Renaissance palaces are the Vatican and the Pitti Palace; the Louvre, the Luxembourg, the palace of Versailles; Hampton Court and Inigo Jones's Banqueting Hall of Whitehall; the Zwinger Palace at Dresden; the Escorial and the Royal Palace at Madrid. See also VATICAN; LOUVRE; HAMPTON COURT; VERSAILLES.

**PALACIO VALDES, ARMANDO** (1853- ), Spanish novelist, born at Entraigo, Asturias, in 1853. He had been writing for 12 years when his best novel, *Marta y Maria*, appeared. Foreign influence is very apparent in his works, though his Asturian humor seems more English than French. His construction and character-drawing are impeccable. Of all modern Spanish novelists he has been perhaps the most frequently translated.

**PALACKY, FRANTISEK** (1798-1876). Czech statesman and historian was born at Hotzendorf, Austria, June 14, 1798. In 1825 he founded the *Journal of the Bohemian Museum* which later became the leading literary periodical of Bohemia. In 1823 Palacky moved to Prague and became interested in Bohemian history. He devoted several years to active research work and in 1836 published the 1st volume of his *History of the Bohemian People*. The 5th and last volume was published in 1867. He favored the creation of a Czech kingdom and attended the Slavonic Congress which met at Moscow 1867, but took no interest in the Austrian Senate of which he was a life member. Palacky died May 26, 1876 at Prague.

**PALAMON AND ARCITE**, a tale of two Theban princes who love the same lady, told first by BOCCACCIO in the *Teseide*, used subsequently by many authors but most notably of all by CHAUCER in *The Canterbury Tales*. The two friends Palamon and Arcite one day espy the beautiful Emilye from the window of the prison in which they are held by Theseus, and fall—both at the same instant—in love with her. Freed by Theseus, they joust in a tournament to decide the issue of their love. Arcite, after defeating Palamon, dies of a fall from his horse, and Palamon thus wins Emilye.

**PALATKA**, a city in northeastern Florida, the county seat of Putnam Co., situated on the St. John's River, 55 mi. south of Jacksonville. Bus and truck lines, river boats and three railroads serve the city, which is a shipping center for citrus fruits, potatoes, poultry and live stock. Cypress lumber industries and wholesale trade the chief local interests. Palatka was the headquarters of the United States Army during the Seminole War, the Federal government establishing a military post here in 1837. Palatka was founded in 1820, incorporated as a city in 1853. Pop. 1920, 5,102; 1930, 6,500.

**PALAVIAN**, an extinct language of central Asia Minor preserved in a few incantations in CUNEIFORM found at Boghaz-Köi and closely related to KANISIAN.

**PALEMBANG**, the largest city of SUMATRA in the Dutch East Indies. The city is capital of the residency of Palembang and is situated on the banks of the Palembang, or Musi, River, about 45 mi. from its mouth at the Straits of Banka. Palembang is built partly on posts raised in the river and partly on rafts floating in it, but the houses of the rich Chinese merchants and the public and government buildings are of stone built on solid ground. The river is quite deep and affords passage for the largest vessels to the port of Palembang, which is one of the finest in the MALAY ARCHIPELAGO. Palembang is the only port outlet for the exports of the province. Pop. 1927, about 63,000; of the residency, 872,552.

**PALEOBOTANY**, the botany of the past; the science that treats of the plants and plant assemblages that have inhabited the earth since life first came into existence. It derives its facts primarily from the relics of ancient plant life which have been preserved as fossils. These may be pieces of bark, wood, roots, fruits, seeds or spores, or foliage; or casts, molds, or impressions of any of these.

They are preserved in the rocks in a variety of ways. They may be simply buried by sediment and their substance slowly oxidized to a carbon compound, such as lignite and jet, or they may be dissolved, leaving only an impression of such a thing as a leaf, or a cast of a stem or hard fruit. This very common method of burial is called inclusion and the extent to which the detailed features are preserved will depend largely on the fineness of grain of the sediment. A fine-grained mud will generally show every detail and a coarse sediment, such as a sandstone, will show but little detail.

A second method, generally called petrification, is the infiltration or partial replacement of the specimen with some chemical solution such as calcium or magnesium carbonate or silicic acid. A great variety of mineral compounds occasionally replace organic parts, but those mentioned are the most common agents. Plant tissue which has been silicified or calcified may be cut, polished, and studied microscopically, thus disclosing its intimate structure.

#### PALEOZOIC PLANTS

The simplest and oldest fossil plants were marine and these have been found in rocks as old as the pre-Cambrian. At a very much later period marine forms commenced to invade the land surfaces of the globe, and from the standpoint of human interest and evolutionary adaptation, this shift from aquatic to terrestrial conditions, and the structural changes which it involved, constituted the most important step in the evolution of the higher plants.

Although microscopic things and seaweeds are scattered through the older rocks it is not until the Devonian period is reached that any considerable number of terrestrial plants have been discovered. These Devonian plants are intensely interesting, some being of so simple an organization that although they probably are not actual missing links, they fulfill to

a remarkable degree just what an intermediate stage between a marine alga and the simplest of terrestrial plants should be like.

There are a considerable variety of Devonian terrestrial plants known, but many of these are based upon impressions of stem fragments and but a few show the structure of the various parts. The petrified genus *Rhynia* from the middle Devonian of Scotland will serve in a general way to indicate the simplicity of structure of *Psilophyton*, the most widely distributed lower and middle Devonian form; *Hornea* and other imperfectly known types.

*Rhynia* was small, with stems less than 10 in. tall and not more than  $\frac{1}{8}$  of an in. in diameter, rootless and leafless. In place of a root was an underground stem with scattered protuberances bearing absorbent hairs. The upright stem was sparingly forked, had a central strand of vascular tissue and some of the branches ended in relatively enormous sporangia. The surface of the stem was sparingly covered with hemispheric protuberances which may correspond to the spines of *Psilophyton*, *Schizopodium* and *Asteroxylon*.

Most of the known earlier Devonian land plants were small, dichotomously branched marsh dwellers, but before the close of the period petrified woods of much larger stems (*Dadoxylon*) occur, along with the ancestors (*Protolopodendron*, *Cyclostigma*) of the Carboniferous lepidodendrons and sigillarias, and fernlike seedbearing plants of considerable size (*Eospermatopteris*, *Aneurophyton*?, *Archæopteris*?, and *Cladoxylon*?).

With the dawn of the Lower Carboniferous the aspect of the vegetation changed rapidly to one which, although its constituents were constantly shifting, contained many important types continuing for millions of years until they were largely supplanted in Permian time by conifers and cycads foreshadowing the abundance of these in the succeeding Mesozoic era.

Among these were lepidodendrons, sigillarias and their allies, distant relatives of existing club mosses, with columnar, often large trunks, covered with geometric leaf bases and small scale-like or needle-like leaves, and bearing large cones with two kinds of spores, megaspores and microspores: Cordaites and its allies with tall stems; large, broad, parallel-veined leaves, catkin-like fructifications of two kinds, one pollen bearing and the other developing mostly winged seeds; Seed ferns of various kinds with large complex seeds borne on the fronds; Calamites and their allies, distant relatives of the existing horsetails (*Equisetum*), with tall jointed and ribbed stems, cone bearing, with leaves in whorls; True ferns often of large size (*Psaronius*, *Pecopteris*).

Most of these Paleozoic plants had acquired the habit of forming secondary wood. This enabled them regularly to increase the diameter of their stems. Several of the Lepidophytes also show progressive modification of their spore producing parts until these resembled in many respects and functioned like seeds. Spore-forming plants produce one or two kinds of spores which consist of a single cell much like a

modern pollen grain; these are shed in enormous numbers at maturity and their chance of development is entirely fortuitous. In *Lepidocarpon*, which will serve as an illustration of one of these Carboniferous quasi-seedbearing Lepidophytes, the spores developed in cones similar to those of *Lepidodendron*. These cones are usually referred to the genus *Lepidostrobus*. Of the larger spores (megaspores) only one in each sporangium grew to maturity and while it was enlarging the axis on which it was borne grew up around it leaving only a slit-like opening through which the small spores entered and fertilized it, thus insuring

*Cordaite*s with their large flat pendant evergreen leaves; clumps of marattiaceous and other ferns; slender stemmed *Sphenophyllum*s cambering over and among the vegetation; and a variety of seed ferns everywhere, some with long slender stems like *Lyginopteris* dependent on the jungle for support and others with massive stems like *Medullosa* quite capable of supporting themselves in the universal upward competition for light. World conditions were more uniform than they are at the present time and many of the Devonian and Carboniferous plants were practically cosmopolitan in their distribution.

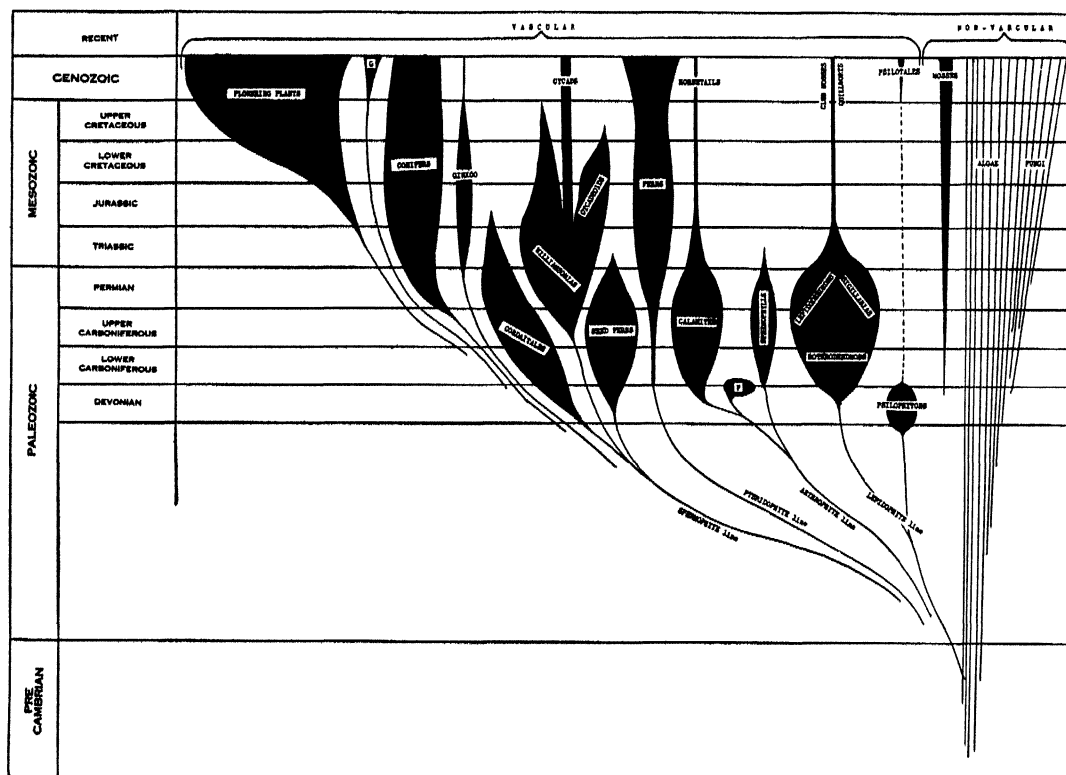


DIAGRAM SHOWING RELATIONSHIPS AND RELATIVE ABUNDANCE OF PRINCIPAL PLANT GROUPS DURING GEOLOGIC HISTORY

protection and an adequate supply of water and food material during these processes. Then at maturity the whole scale with its large spore drops away from the cone much as a carpel with its enclosed seeds, does among the flowering plants. Comparable adaptations occur in *Miadesmia* and *Mazocarpon*.

A generalized picture of a Carboniferous or Permian coal swamp would show clumps of slender, graceful *Calamites*, scouring rushes enlarged to 50 times the size of the modern ones, growing in and about the margins of standing water; massive columnar *Sigillarias* with their persistent crown of needle-like leaves and their shallow spreading roots known as *Stigmara*; tall *Lepidodendrons* with their branched and evergreen crowns and arabesque marked stems; lofty

In late Paleozoic times and associated with well-marked glacial deposits in Australia, Tasmania, India, South Africa, and South America are found traces of a peculiar and regional flora in which the cosmopolitan types, such as characterize the floras in the Northern Hemisphere, are largely absent. This southern flora is termed the *Glossopteris* or *Gangamopteris* flora from its two most characteristic elements. These were simple fern-like fronds, shaped like those of the common hart's-tongue (*Scolopendrium*), and were borne on creeping stems or rhizomes, long known by the name of *Vertebraria*. The fronds of both genera are much alike, of a similar lanceolate to obovate form and with an anastomosing venation. They are distinguished from one another by the presence of a

thick midrib in *Glossopteris*, and by the practical absence of a midrib in *Gangamopteris*. In the former genus the sporangia, borne upon very much reduced oval fronds, are known. It is not certain whether they were true ferns or represent the seed ferns so common in the Paleozoic.

Associated with these *Glossopteris* and *Gangamopteris* fronds were the remains of *Phyllothea* and *Schizoneura*, relatives of the northern *Calamites*; fronds of Cycadophytes (*Pterophyllum*, *Glossozamites*) and Neuropteridium; various fragments of ferns (*Pecopteris*, *Sphenopteris*, *Taniopteris*); conifers (*Voltzia*), and the leaves of *Noeggerathiopsis* and *Eurphyllum*, probably relatives of the northern Cordaites. From the combined evidence of the organisms, their distribution, and the continental character of the deposits, geologists have visualized a hypothetical southern continent, called Gondwana Land, extending from Australia to India and thence to Africa and South America and existing throughout the Permian and the first half of the Mesozoic. It was very probably connected southward from both Australia and South America with the land mass in the south polar region known as Antarctica, and a restricted land bridge connected it across northwestern Africa with southwestern Europe. Elsewhere along its northern borders a Mediterranean sea encircled the globe, separating Gondwana Land from Angara Land, the ancient continental mass of Asia, and from Eria, North America. It was upon this Gondwana continent or on the Antarctic continent to the southward that the *Glossopteris* flora had its inception.

Climatic changes resulting from this widespread emergence and elevation of the land and the consequent alteration of the oceanic and atmospheric circulation furnished the stimulus for its evolution, and these climatic changes culminated in a glaciation that probably exceeded in its magnitude that of the more familiar and relatively recent Pleistocene Ice Age. The effect of these changes was to banish gradually the more characteristic elements of the cosmopolitan flora from this region, although it is known to have constituted the original vegetation. With varying conditions that can be interpreted only as an amelioration of the climate, certain members of the northern cosmopolitan flora, especially the Lepidophytes, succeeded in reestablishing themselves. It is probable that they were never entirely extinct in the whole of Gondwana Land, but that they had been present throughout the Glacial period in northern Africa and northern South America.

#### MESOZOIC PLANTS

The Mesozoic Era is often called the age of Gymnosperms since the ginkgo, cycads and conifers are abundant and characteristic and afford a striking contrast to the arthropytes, lepidophytes and seed ferns of the Paleozoic and which survive very sparingly as an inconspicuous and little known element in the older Mesozoic. Fossil plants are not well-represented in the earliest Mesozoic and it is not until the Upper

Triassic (Keuper and Rhätic) that they become abundant and by that time their facies is typically Mesozoic. Ferns now become abundant and certain still existing families such as the Gleicheniaceæ and Osmundaceæ can be clearly recognized. Marattiaceæ ferns are perhaps the most abundant, and several genera of Dipteriacæ (*Clathropteris*, *Dictyophyllum*), a family with only 4 species of limited range in the modern oriental region were cosmopolitan. The Arthrophyta were less varied than earlier, the Sphenophyllums being sparingly represented by *Trizygia*, the calamites by *Neocalamites*, *Schizoneura*, *Phyllothea* and large Equisetums. Except for a few representatives of the old order (*Pleuromeia*, *Lycostrobus*), the Lepidophytes were unimportant, and the same statement applies to the seed ferns.

Cycadophytes, first recognizable in the Carboniferous, constitute a prominent element in the Triassic. Some of the genera are *Pterophyllum*, *Otozamites*, *Sphenozamites*, *Ctenis* and *Nilssonia*, belonging to slender stemmed branching forms, which continue abundant through most of the Mesozoic. In late Jurassic and Lower Cretaceous time numerous cycads with squat pineapple trunks made their appearance and much of the knowledge of the structure of these interesting plants is derived from the silicified trunks of the cycadeoids, as these squat forms are called. The Palæozoic cordaites are represented in the Triassic by *Yuccites* and *Noeggerathiopsis*. *Ginkgo* and *Baiera* are widespread as indeed they are through much of the Mesozoic. Conifers are abundant and varied throughout the whole Mesozoic. Especially characteristic of the Triassic is *Palissya* with dimorphic foliage and lax cones, *Stachytaxus*, *Palæotaxis*, *Cheirolepis*, *Sphenolepis* and *Widdringtonites*. *Voltzia* survives from the Permian.

During the Jurassic the rather uniform climates resulted in cosmopolitan floras from Greenland to Antarctica. The bulk of these comprise ferns, cycads and conifers. The dipterid ferns continued as did some of the Marattiaceæ and Gleicheniaceæ, the family Matoniaceæ became prominent (*Laccopteris*, *Matonidium*) and the families Schizæaceæ (*Klukia*), Cyatheaceæ (*Coniopteris*), Polypodiaceæ (*Cladophlebis*, *Onychiopsis*) make their appearance. No seed ferns are known and the arthropyte and lepidophyte element becomes very subordinate. Cycad fronds and fructifications are exceedingly common and continue to be through the greater part of the Lower Cretaceous. The Araucarian conifers are prominent and other types continue from the Triassic supplemented by *Brachyphyllum*, *Fieldenia*, *Phænopsis* and other new and often little understood types.

Lower Cretaceous plants are known from all the continents and they are especially abundant in North America and Europe. They carry on the Jurassic tradition and their chief distinction rests upon the appearance of flowering plants in North America, Europe, Greenland and New Zealand. These earliest known types do not appear to be primitive (only the foliage and secondary wood structures are known), and an

extended earlier but unknown period of evolution seems to be demanded. By the close of the Mid-Cretaceous both monocotyledonous and dicotyledonous angiosperms are not uncommon. These include palms and most of the principal families, except the most specialized such as the orchids among the former and the composites among the latter. By Upper Cretaceous time the older Mesozoic elements had almost entirely disappeared and modern types are in the majority, although ginkgos were common and

western United States. Flood plain deposits with riverside plant types abound at certain horizons, and old lake beds yield a plentiful harvest. Two of the most celebrated lake deposits are those of the Miocene Lake of Oeningen on the Swiss border of Baden, made classic by Heer's researches, and the small Miocene lake of Florissant in the heart of the Colorado Rockies, where successive showers of volcanic ash entombed an extensive flora in the resulting fine-grained shales. Tertiary plants are also abundant in

#### CLASSIFICATION OF PLANTS

<b>Thallophyta</b> (Thallus plants)	Existing plants are capable of a more modern treatment, but the so-called Thallophytes of the geologic record are usually ambiguous
<b>Bryophyta</b> (Moss plants)	MUSCI (Mosses) Sphagnales, Andreaeales and Bryales HEPATICÆ (Liverworts) Marchantiales, Jungermanniales and Anthocerotales
<b>Pteridophyta</b> (Fern plants)	CÆNOPTERIDÆ * (PRIMOFILICES) Botryopteraceæ * Zygopteraceæ, * etc. EUSPORANGIATÆ Ophioglossales, Marattiales and Psaroniales * LEPTOSPORANGIATÆ (EUFILICES) Osmundales, Gleicheniales, Matoniales and Polypodiales HYDROPTERIDÆ (Water ferns) Marsiliaceæ and Salviniaceæ
<b>Lepidophyta</b> (Scale-leaf plants)	LYCOPODIALES (Club mosses) Lycopodiaceæ and Selaginellaceæ ISOETALES (Quillworts) PSILOETALES PSILOPHYTALES * LEPIDODENDRALES Bothrodendraceæ, * Lepidodendraceæ * and Sigillariaceæ *
<b>Arthrophyta</b> (Jointed-stem plants)	SPHENOPHYLLÆ Sphenophyllaceæ * CALAMARIÆ Pseudoborniales, * Calamariales * (Calamites) and Equisetales (Horsetails)
<b>Pteridospermophyta</b> * (Seed ferns)	Lyginopteraceæ, * Medullosaceæ, * Cladoxylaceæ, * etc.
<b>Cycadophyta</b> (Cycad-like plants)	Williamsoniales Cycadeoidales, * Caytoniales * and Cycadales
<b>Coniferophyta</b> (Conifers)	CORDAITALES * (Cordaites) Cordaitaceæ, * Poroxyllaceæ, * Pityaceæ, * etc. GINKGOALES (Ginkgos) TAXALES (Yews, Podocarps and Phylloclads) PINALES (Pines, Cedars, Sequoias, etc.) ARAUCARIALES (Kauri and Chile "pines") GNETALES (Gnetums, Ephedras, etc.)
<b>Angiospermophyta</b> (Flowering plants)	MONOCOTYLEDONÆ and DICOTYLEDONÆ

\* Groups wholly extinct.

antipodean genera like *Araucaria* and *Dammara* still maintained their Holarctic range. The dawn of the Tertiary witnessed a great modernization.

#### CENOZOIC PLANTS

Tertiary plant remains are exceedingly abundant and include those found in travertine, such as the rich Paleocene floras of Sézanne in France, those entombed in amber, especially the wonderfully preserved flowers in the lower Oligocene Baltic amber. Buried swamp deposits preserved as lignite coals and the associated clays and shales are rich in plants, and such deposits are common throughout the world and have been particularly exploited in Europe and the

the far north in Alaska, Ellesmere Land, Greenland, Spitzbergen, and elsewhere, and they have also been found on Seymour Island on the margin of the Antarctic continent. Materials for the complete elucidation of Tertiary floral history are being rapidly accumulated. In some respects the Tertiary floras are more interesting than those that preceded them, since climates were genial, land surfaces ample, and the vegetation was exceedingly luxuriant and varied. Moreover, the key to the understanding of present-day geographical distribution is largely dependent on an understanding of these Tertiary floras.

The early Tertiary flora consisted of familiar hardwoods, such as willow, gum, cottonwood, sycamore.

# PALEOBOTANY



COURTESY BROOKLYN BOTANIC GARDEN

## LAND PLANTS IN THE PALEOZOIC ERA

1. Carboniferous-Permian tree clubmosses. Left, *Lepidodendron*; right, *Sigillaria*.
2. *Calamites*, horsetail group.
3. Paleozoic gymnosperms. Left, *Poroxylon*; right, *Cordaite*.
4. Early land plants. Left, *Psilophyton*; left center, *Rhynia*; right center, *Asteroxylon*; right, *Hymnia*.





oak, walnut, hickory and others associated with figs and palms, and numerous exotic types, such as camphor, breadfruit, sterculia and baubinia, that have since become extinct on this continent but still survive in other regions. Sequoia still flourished as far east as Dakota and along the Mississippi Gulf, and its ferruginized cones are abundant at some Eocene horizons, while the clays contain profuse impressions of its foliage. At this time (Eocene) the Gulf of Mexico extended northward beyond the mouth of the Ohio and its shores were clothed with a wonderfully varied flora containing numerous migrants from the tropics, such as breadfruit, custard apple, soapberry, rain tree, alligator pear, mangrove, fiddlewood, devilwood, persimmon, iron wood, buckthorn, wild lime, sea grape, and many acacias and mimosas. Among these were forms such as the Nipa Palm, distributed by ocean currents, and now confined to the littoral of south-eastern Asia.

During the Oligocene the climate became cooler and drier. Many modern African and Australian types occur in Europe. In America the plains type of country became prominent in the west as a result of the rising mountain systems. The polar floras retreated to lower latitudes. Along the Gulf of Mexico tropical types, such as the breadfruit and camphor survived, but were gradually replaced by temperate trees such as the elm and hickory, until toward the close of the Miocene the flora became very similar to that of to-day, although the species were extinct forms of our familiar genera of mixed hardwoods which ranged farther west in the prairie states than they do at present, and exotic types as the ailanthus at Florissant give testimony to the subsequent lapse of time.

The Miocene forests of Europe were extensive and contained a greater variety than do those of modern Europe. The floras of the Northern Hemisphere were still largely cosmopolitan, or at least Holarctic, and the Miocene and Pliocene deposits of Europe contain many American or oriental types, such as walnuts, hickories, bald cypress, magnolia, tulip tree, sassafras, and sweet gum, which subsequently became extinct on that continent.

The Pliocene florally is simply a somewhat modernized Miocene. American Pliocene floras are little known, but include forms like the water chestnut (*Trapa*), now extinct in the Occident. In Europe the Pliocene was a time marked by great geographical changes in the Mediterranean region, where the sea margins were densely forested with a great variety of mixed hardwoods, among which many American and Asiatic types were prominent. Numerous still existing species, such as the bald cypress, box, maple and yew appeared during the Pliocene, plant-bearing deposits of this age being especially common throughout Europe. In South America the tropical rain forests of the Amazon basin still covered the present desert region along the Pacific coast, and the Andes were at least 14,000 ft. lower than these mountains are at the present time.

The Pleistocene, because of the widespread glacia-

tion which gives it a distinctive place in geological chronology, is, for humanity, the Ice Age or Glacial Period, although a similar period of climatic rigor has already been mentioned in connection with the Permian Glossopteris flora, and evidence of similar glaciations in the early Paleozoic and pre-Paleozoic times has been discovered in recent years. That the Pleistocene glaciation was contemporaneous with the evolution of the human stock and exercised a profoundly modifying influence on the noble races of mammals and forest trees of the Northern Hemisphere enhances its interest, as does the obviousness of its modification of the topography, resulting in numerous lakes, ponds, and bogs. The freshness of its moraines, boulder till, and sand plains, all scarcely modified in the few thousands of years that have elapsed since the last ice sheets disappeared, also emphasized its nearness to human history.

The inauguration of glacial conditions found an essentially similar flora in all three of the continents of the Northern Hemisphere. The retreat of the last ice sheet left an impoverished flora in Europe and two great asylums of survivors in eastern North America and eastern Asia. The explanation, broadly speaking, is most simple. Neither America nor Asia with their extensive coastal plains and north and south mountain chains offered insuperable barriers to dispersal southward and back, while in Europe the mountain ranges, Pyrenees, Alps, Carpathians, Balkans and Caucasus all trend east and west, many were lofty enough to be local centers of glaciation, while the sea effectually stopped the gaps between the various mountain systems. Hence many of the plants of the Pliocene forests of Europe were unable to escape extinction and so perished.

There were at least four separate times when ice sheets accumulated over the land, and these were separated by long intervals of genial climate known as Interglacial periods, of thousands of years' duration, during which the floras spread northward, even beyond their present range. Many such Interglacial floras have been described from Europe, where the subject has been diligently investigated in connection with the economic study of peat bogs. The best known Interglacial flora of North America, where the extensive peat resources have been largely neglected, is that found in the Don Valley near Toronto. Here are found the plane tree, maple, osage orange, and other types that do not quite reach that latitude at present. Other traces of the Pleistocene floras are found in cave deposits associated with a partially extinct fauna, and buried swamp deposits overwhelmed by a mantle of sand during changes along the coasts yield their quota of forms, most of which are still existing species, such as the bald cypress, loblolly pine, sycamore, poplar, hickory, river birch, and species of oaks. All of these show that the Interglacial floras scarcely differed from those of to-day, except in the details of distribution of the various species.

During the epochs of glaciation these temperate forests retired southward and gave way along the ice

front to arctic willows and dwarf birches, which penetrated southward to about latitude  $40^{\circ}$  in this country.

The post-glacial amelioration of the climate, the opening of areas that had been covered with glaciers, the mixing of soils through ice action, all combined to stimulate evolutionary activity, particularly among herbaceous forms, many of which date from this time. It seems probable that the characteristic temperate zone herbaceous families became prominent at about this period.

Possibly more potent than natural causes in modifying the existing vegetation has been the action of humanity, with fire, ax, and domesticated grazing animals. Forests are now waning. Human intercourse results in untold feats of distribution, emphasized by the familiar cosmopolitan weeds of these modern days. Insect and fungal pests are similarly spread both rapidly and widely, and all of these factors tend to increasingly restrict or even exterminate the native vegetation.

E. W. BE.

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**PALEOGRAPHY**, in the widest sense of the term, the science which deals with the forms, ways and means of writing from ancient times to the invention of printing, whether written in pictographic, cuneiform, syllabic or alphabetic symbols (*see* PICTOGRAPH; CUNEIFORM; ALPHABET), or whether executed on imperishable (stone, marble, metal, terra-cotta, etc.) or on perishable material (papyrus, parchment, wax tablets, leather, paper, etc.). In a more restricted sense, paleography designates the study of manuscripts written on destructible material. The oldest manuscripts come from Egypt, 4000 B.C., from Greece, 400 B.C., and from Rome, 100 A.D.

The different types of Greek and Roman letters may be classified as majusculus, capital letters or letters written separately, resembling modern capitals; and minusculus, a cursive script developed from the former and constituting the basis of the modern small Greek and Roman letters.

I. M.

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**PALEOLITHIC PERIOD**, the period of human prehistory in which the most durable and useful implements used by man were fashioned from pieces of hard stone, generally flint nodules, which were chipped by blows with another stone, or flaked by pressure. Evidence from sites in Suffolk shows that man was acquainted with the use of fire even at the dawn of the Paleolithic, or Old Stone Age. But there is no evidence that pottery had been discovered, or that any animals had been domesticated. Man was still a hunter and fisherman. Beginning at the oldest, the stages of the Paleolithic period were: PRE-CHELLEAN, CHELLEAN, ACHEULIAN, forming together

the Lower Paleolithic; MOUSTERIAN, which forms the Middle Paleolithic; AURIGNACIAN, SOLUTREAN and MAGDALENIAN, forming together the Upper Paleolithic. Burial of the dead was practiced as early as the Middle Paleolithic, perhaps earlier. That there was some conception of a future life is shown by the interment of implements with the dead. Early Paleolithic man may have lived in tents of skin. With Middle Paleolithic came the period of cave dwellings. *See* ARCHAEOLOGY.

**PALEONTOLOGY.** The word paleontology comes from the Greek and implies the study of ancient things, specifically those organisms, either plant or animal, which formerly populated our globe. Its documents are the fossils found in greater or less abundance in the sedimentary rocks, the world over.

While it may be studied for itself alone in each of the several phases, PALEOBOTANY, PALEOZOOLOGY, or PALEOBIOLOGY, it is also contributory to several other sciences which concern themselves either with the earth or its inhabitants, geology, geographical distribution, the configuration of the land masses in geologic time, or climates of the past. In fact it serves to render vivid the past history of our globe in all aspects of the picture.

Paleontological evidences lend weight to some of the greatest of generalizations, notably that of organic evolution, for the fossil record alone will betray true relationships in many cases, and it alone can give the actual historic data upon which rests the fabric of the doctrine of continuity with change.

#### SORTS OF FOSSILS

Fossilization always implies natural burial, by whatever means, and consequent preservation, the degree of fossilization being in general in direct proportion to the antiquity of the relic. Usually, the fossil is assumed to be of a past geologic age, other than that which geologists call the Recent, and to be extinct in its original form, even though somewhat altered descendants may yet be living.

Fossils are not all of one kind, nor are they necessarily turned to stone according to popular belief. Thus there may be actual preservation of more or less of the original material, either entombed in ice or frozen soil, as are the mammoths and woolly rhinoceroses of Siberia. They may also be preserved in their entirety in amber, the solidified exudation of certain coniferous trees, especially of Oligocene age. These are principally insects, spiders, and other minute creatures which were entrapped in the sticky gum when it was fresh, and preserved with marvelous fidelity, except that the internal soft parts have been desiccated.

Oil-saturated soils have given us wonderful relics, a rhinoceros with hide and horn more or less intact, and a bygone elephant, found in Galicia. Bones and shells may be practically unaltered, except for the loss of animal matter. Mineral substances in solution gradually pervade the natural object, filling the spaces which the animal matter once occupied, and the fossil

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gains appreciably in weight; still much of the original substance remains. Or the specimen may be entirely replaced by the mineralizing substance. This rarely occurs in animal remains, as the decay of the perishable portions proceeds at too rapid a rate. In plants, however, the original wood may undergo such replacement molecule for molecule, usually by silica, so that even the microscopic structure is revealed with remarkable accuracy. Later, the specimen may be changed to agate or opal and the organic origin largely obscured.

A replacement of the original substance, as of a limy coral by silica, where the minute structure is not preserved, results in what is known technically as a pseudomorph, or false form; where the minute structure may still be seen the process is called histometabasis from the two Greek words, *histon* meaning tissue, and *metabasis* meaning exchange.

Again, a fossil may be a mere mold or impression from which all trace of the original organism has disappeared. Such can best be studied by an artificial cast taken from the mold. Or Nature may also supply the cast by filling the mold with some material in suspension such as sand or clay which afterward solidifies, giving a replica of the original. Shells lend themselves to both processes, and much may also be learned from the natural casts of the brain case or other cavities of vertebrates which become thus filled and the contents hardened. Of an analogous character are the fossil footprints, impressions of the feet of living animals of the past. Here, again, the depressed intaglio-like print may be preserved, or the cameo-like filling of the track, or both. Imprints of the skin may also be found, as well as phenomena of an inorganic nature, such as rain prints, ripple-marks, and mud cracks, which often give a clue to the environmental conditions, climatic and otherwise.

Finally there are coprolites which are the fossilized excrement of animals, and which afford evidence, aside from that inferred from the character of the mouth and teeth, of the food which served to sustain life.

Thus the science of paleontology has for its basis vastly more than mere fragments of bone and shell, and, while the records vary in their clarity, the sum total of the knowledge of the past history of organisms is vast.

During the pre-Darwinian times, up to the publication of the famous *Origin of Species* in 1859, students of fossils were largely concerned with individual specimens or groups of animals and plants, or with faunal studies in which all of the organisms in a given geological formation were considered as an assemblage. With the coming of Darwin's epoch-making work, however, such men as Huxley and Marsh began the study of evolutionary series or phylogenies, as they are called. The phylogenies first studied, such as that of the horse-like animals, by Huxley, Kovalevski, and Marsh, were thought to be comparatively simple, with but one or more lines of descent. Later it was found that simplicity was by no means the rule, while some later exponents have gone to the

other extreme in stressing polyphyletic series, either parallel or divergent lines arising from one or few ancestral stocks in the past. This is inevitable with the increase of our knowledge based upon more abundant collections; but judging from the fewness of species of a group living in the same geographical region, one wonders whether the idea of multiple lines occupying different environmental facies of the same general area may not have been somewhat overdone.

#### GEOLOGIC HISTORY OF LIFE

The story of life should be one of continuity, but it will probably never be known in its entirety, due to the imperfection of the geologic record. For the periods and eras of geologic time, which are studied by the sedimentary rocks, are found to be separated by breaks in the sequence of sediments, either due to an actual cessation of deposition during the intervals which separate them, or by subsequent erosion which has destroyed part of the record. Sometimes the indicated time break is enormous in a given region. Again the strata of one period may pass almost insensibly into those of the succeeding age, while later in the column breaks may occur. In other words, the sequence in its entirety can never be seen in any one place, and it is only by piecing together the stratigraphy of many regions that anything like completeness can be attained. Even where the strata seem to pass from one period to the next without apparent break there is almost always a more or less abrupt change indicated in the contained fossils, implying a considerable lapse of time. What was more natural, therefore, than for the older naturalists, Cuvier, and d'Orbigny, who believed in the direct creation of life by divine power, to imagine a series of world-wide catastrophies which not only would account for the breaks in sedimentation, but also for the extinction of old faunas, to be replaced by creations of organic beings to take their place. This not only accounted for the geologic record as it was thus revealed but harmonized as well with orthodox teaching, even though the idea of such successive creations is nowhere taught in the Scriptures.

Our present belief is that there never has been a time of wholesale extinctions with the utter elimination of life from our planet, since life began and the apparent breaks are merely in the record, never in the stream of life itself. Nevertheless, the rate of evolutionary change is a very variable thing. Some ancient beings have weathered all the storms of time and have come down to us almost unaltered from the remotest antiquity. Yet others are swift of change, groups appearing with apparent suddenness, undergoing a brief but remarkable evolutionary career, to be utterly blotted out and replaced by unrelated forms. A race may rise out of obscure origin, but one may rest assured that its ancestors have existed in the preceding ages, though their period of dominance was not yet come; then changing conditions arise which seem suitable for this particular race, and it begins

a period of accelerated evolutionary advance which goes on to its culmination and finally either becomes racially extinct or so largely so as to be reduced once more to a subordinate rôle. Dominant races never give rise to dominant, but the latter always arise from more primitive and generalized forms. Such accelerated evolution almost always accompanies geologic change.

With this by way of background, a brief consideration of the geological history of life itself may follow. Of the origin of life on earth there is no record, nor can there be, for if, as we believe, it occurred but once, the time of its beginning was almost immeasurably remote and the manifestation of it too minute and lacking in organization to make an enduring record upon the rocks. It was not for long, long ages during which life had passed from the one cell to the many celled condition and the animals had learned the habit of lime secretion that the chance for its preservation in fossil form became good. And when this occurred, already two eras, the Archeozoic and the Proterozoic, had dragged out their hundreds of millions of years and the Paleozoic was ushered in. From the beginning of Paleozoic time, therefore, our recorded story of animal life begins, although certain obscure trails and markings and masses of limestone and graphite in the older rocks tell a vague story of its presence. With the beginning of the fossil record, however, all of the great invertebrate phyla are either recorded or implied, which in itself is evidence not only of previous existence but of continuance during a time sufficiently long for tremendous evolutionary changes to have occurred.

These early Paleozoic fossils take the form of sponges, corals, worms represented chiefly by their trails and castings, shelled forms such as clam and snail-like creatures, and the unrelated brachiopods or lamp shells. There were also jointed animals or arthropods of which the early ones belonged to the crustaceans, for the insects and thousand-legs had not yet appeared. While the rôles these creatures played varied in importance, some being more numerous than others, all were marine, and it is not until Silurian times, the third period of the Paleozoic era, that indubitable air-breathing animals in the form of scorpions appear, nor is there any trace of backboned animals until the Ordovician, the second of these periods, although they may have had a previous unrecorded or undiscovered existence.

Of the invertebrate group many are outstanding in their interest, especially in the way in which their evolution is shown in the fossil series. Of these a notable group is that of the cephalopod molluscs, allied to the existing octopi and squids and the chambered or pearly nautilus of poetic fame. The last is a sole survivor of what were for a time the dominant forms of marine life, disputing successfully the rôle of able rulers of the seas with the backboned fishes. These ancient cephalopods, like the nautilus, had an external chambered shell in the outermost compartment of which the creature actually lived, the

inner ones being its successively abandoned dwellings. There were two principal groups, the nautilids, in which the line of contact or suture between the transverse partitions, or septa, and the shell wall were simple, either straight or curved, and the ammonids, in which the suture line became highly complex. In both groups, which ran a more or less parallel, though not synchronous, evolutionary course, the shell is at first straight, then curved, and finally tightly coiled, generally in a flat spiral, until the acme of their evolution reached a condition still retained by the living nautilus. Then when the climax was passed, shell degeneration set in and the coils relaxed until they once more reverted to the straight shell of their ancestors, except that the secondary straightening never involved the embryonic chamber at the beginning of the shell. This enables us to distinguish between primitive and secondary straightening and serves to illustrate the way in which the development of the individual (ontogeny) recapitulates the evolutionary or phylogenetic history of the race.

The arthropods also show interesting evolutionary features. For the typical crustaceans of the ancient seas are the trilobites, so called from the three longitudinal lobes into which their body is divided. These were bottom living creatures, although some had the power of swimming, ranging in size from minute forms up to more than two feet in length. Their evolutionary changes include the assumption of the power of rolling up on the part of some as a protection against their enemies and of varied sculpturing and other ornamenting of the shell, together with the development of spines and excrescences of diverse sorts, usually on the part of those lines which were nearing extinction, although whether there is any connection between spinescence and racial senescence that would herald racial death, as some authorities believe, is a matter of opinion. At all events, out of some of the more generalized of trilobites were to arise all of the higher arthropods, such as the modern shrimps, crabs, and lobsters, the spiders and scorpions, myriapods and insects. The last are amazingly interesting in their conquest of the air, and in the evolution of social or communal life in which but one other group in all nature excels them—man himself. All of their advancement is recorded in the fossil record, although the continuity of their story is not so completely revealed as is that of certain other forms.

But the backboned vertebrates enlist our attention as does no other group, partly because we ourselves belong here and the record of their struggles for supremacy includes our own, and partly because of their high diversification, every possible rôle in the great drama of Nature being filled in turn by some members of the vertebrate phylum. Whatever their origin, the time of their appearance is such that, unlike the invertebrates, their entire evolution takes place within the ken of the paleontologist. Add to this the profusion of their fossils, and the growing completeness of the records of evolutionary lines, and their appeal to our interest is complete.

Fishes, being the most primitive of vertebrates, naturally appear first in time. Certain obscure fossils, of scales and armor plates, which seem to pertain to a vanished race known as the ostracoderms from the shell-like character of their skin, are found in the rocks of Ordovician time. Undoubtedly there were also soft-bodied, cartilaginous, shark-like forms contemporary or even earlier than these, but they have not yet been revealed. By Silurian time the sharks are known, however, and for a time become the dominant vertebrates, although not until the Devonian do they begin the age-old warfare for supremacy with the armored cephalopods of the sea. Out of the shark stem there arose those with the dual capacity of breathing both water, by means of gills, and air, by means of a modified swimbladder, the homologue of the terrestrial lung. By late Devonian time certain of these "lung fishes," apparently driven by adverse conditions, made the great experiment of leaving the limiting aquatic environment and becoming truly adapted to land living, although still of such degree of organization that seasonal return to the waters was necessary in order to bring forth their young. Some of these amphibians still persist in the much altered salamanders, frogs, and toads, while others were to give rise to the true reptiles which no longer returned to the waters and abandoned gill-breathing entirely. Not only are the reptiles, who underwent a most amazing divergence, worthy of consideration for themselves, but out of them were to come in turn the two highest vertebrate classes, the birds and mammals.

The waters of the earth, while fostering the evolution of the various invertebrate phyla, are nevertheless limited in the range of conditions within which no vertebrate higher than a fish could possibly evolve. The terrestrial realm, on the other hand, offers environmental conditions as varied as may be, and there is always the call of the sea to tempt the higher vertebrate to return to a condition which often in a most surprising way brings about a convergence of form and adaptation comparable to the fishes before the emergence.

Of all the hosts of reptiles, and there were many, especially during the Mesozoic period to which the popular name of the Age of Reptiles is given, there were those in every line of terrestrial evolution. They were Nature's first great attempt to people the world with higher animals, and they met efficiently the demands of all terrestrial environments, forest and open country, swamp and desert, as also the sea and air, for there were true fliers and swimmers among them, as well as those who dug, or crawled, or ran. The most interesting of all, at least in the popular mind, were the dinosaurs, a collective group of several divergent races, varying in their habits and habitat, and differing amazingly in their size and armament. Some were fleet and light of limb, defended by tooth and claw, others slow-moving, ponderous, either armed with horns or defensive mail; yet others seemed to have depended on bulk alone for immunity from at-

tack. All were apparently cold-blooded, as are modern reptiles, and hence active within certain temperature limits only. With them there was no need of mental fitness and, as their brain implies, their life was largely one of instinctive physiological response, though as animate beings the mechanical design was often superb.

During their dominance, which lasted more than a hundred million years, the higher mammals and birds existed, the former particularly occupying a very humble rôle, for the period of their supremacy was not yet come. Finally the long-drawn Mesozoic came to a close, and with it the earth movement which American geologists call the Laramide Revolution. This meant changes in the face of nature and of climate which in some way, not as yet entirely understood, resulted in a wholesale extinction of the reptilian hordes, leaving but the lizards and snakes, turtles and crocodiles to carry on the tradition of reptilian greatness. Then there emerged out of their former obscurity the warm-blooded, furry mammals which in their subsequent radiation into the several environmental facies of earth, sea, and air, replaced the ancient reptiles so effectively as to make their survivors of little importance in the economy of nature to-day. Whether the latter could once more regain their supremacy were the mammals blotted out, as some have held, is a matter of opinion incapable of proof. Certainly the present temperature conditions of the world would materially restrict their habitat to the warmer regions, so that their distribution could not extend as once it did.

We can trace the evolution of most existing mammals back through their Cenozoic ancestry. There have been many extinctions of side lines and in some cases, such as that of the giant ground sloths, entire lines have been blotted out. Many groups formerly of wide distribution are now restricted to local areas and are few in number compared with that of Cenozoic times. For since the mammals rose to their culmination the world has passed and is yet passing through a period of climatic stress, the Glacial period, which was an extremely critical time for organic life. Though the earth is still well populated to-day, some amazingly interesting and abundantly endowed mammals have passed away forever.

With the coming of mammalian evolution a greater premium was placed on mental fitness than ever before. The Age of Brawn passed with the reptiles, and the Age of Brain was ushered in. Physical strength with a paucity of intelligence is occasionally seen in otherwise successful lines, such as the rhinoceroses, but on the whole the psychic aspect of the evolution which culminated in mankind is everywhere apparent.

Perhaps the mammals which make the greatest appeal to the evolutionary paleontologist are certain of the ungulates such as the horses, camels, and elephants, and the huge extinct titanotheres, of which our knowledge is very complete. The carnivores, especially the cats, also enlist our interest, and finally



the primates, including fossil man, of which we know the least, although continual discovery is constantly clarifying our vision of this our own evolutionary line.

Paleontology will never be an exact science in the sense that mathematics is, for there will always be gaps, some of which are apparently unfillable, and the matter of conjecture must necessarily enter in. For future field research Central Asia has already given abundant promise of what further exploration would yield. Africa and South America also in large part withhold their secrets, while Canada is just beginning to reveal hers.

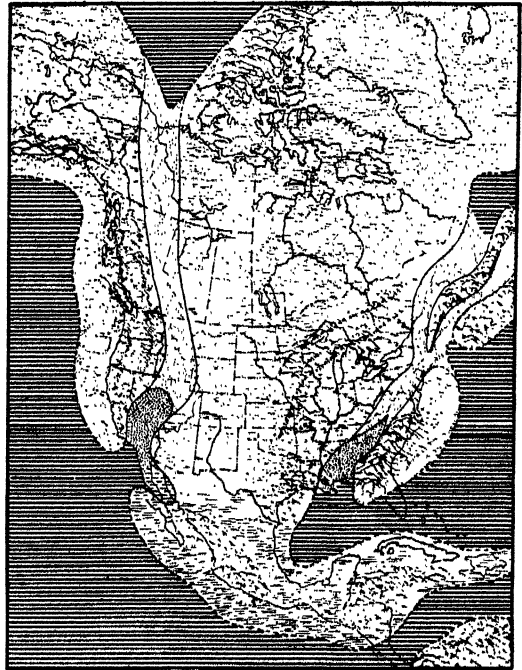
R. S. L.

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**PALEOZOIC**, the third era in geological history, and the first one in which highly fossiliferous rocks were formed. Following the Pre-Cambrian (ARCHEOZOIC and PROTEROZOIC ERAS), whose rocks are almost devoid of direct evidences of life, the strata of this era are crowded with fossil evidences of a teeming life in the seas of that time. Even in the lower formations, known as the Cambrian, are preserved the fossil records of representatives of all the great branches of invertebrate animals. The earth had passed through more than half of its history by the time the Paleozoic began, so it is no wonder that the evolution of life was well advanced. In the previous eras life had its origin differentiated into vegetable and animal, and the latter progressed along the road of invertebrate evolution, preparing the stage for the appearance of the vertebrates. There are but scattered records from the earlier chapters of this story, probably because hard parts capable of fossilization were not developed. Some of the chapters are lost because they unfolded during the long erosion interval between the Proterozoic and the Paleozoic, the rocks then formed not yet having been discovered. Great mountain ranges were thrust up at this time in Canada and in the United States, and the continent stood high above the sea. When EROSION and WEATHERING eventually wore the lands down, and the seas, transgressing upon them, deposited Paleozoic strata, marine invertebrate life, highly evolved, came with the ocean waters. Animal life implies plant life, upon which it ultimately depends. Consequently plants must have been abundant in the early seas, but their fossil remains are even more fragmentary than those of animal life.

Paleozoic means the era of old or ancient life. On the basis of faunal and geological changes, it is subdivided into periods which are, in ascending order, the Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian and Permian. The last three were formerly classed as subdivisions of the Car-

boniferous period but are now considered as of equal rank with the other periods. The Paleozoic amounts to almost 30% of the earth's known history, beginning about 600,000,000 years ago and lasting for almost 400,000,000 years. The names of the periods are derived from the areas in which their rocks were first studied, or are best developed. The lower part of the Paleozoic was worked out in Wales early in the 19th century by Adam Sedgwick and Sir Roderick Murchison; Cambrian is from the Latin name of that region, and Ordovician and Silurian are from the names of ancient tribes that lived there. Devonian is after Devonshire, in England, while the Mississippian and Pennsylvanian are named for the Mississippi Val-



CHARLES SCHUCHERT, OUTLINES OF HISTORICAL GEOL., JOHN WILEY & SONS

**APPEARANCE OF NORTH AMERICA IN CAMBRIAN TIME**

Epi-continental seas dotted; oceans ruled; lands in light, wavy lines. The land was devoid of vegetation and the climate mild and arid

ley and the State of Pennsylvania. The province of Perm, in Russia, gives its name to the closing period. In the coinage of the older term, Carboniferous, the foregoing principle was not applied, since it refers to the large amount of carbon, or coal, found in strata of that age.

The rocks of Paleozoic age have been subjected to less METAMORPHISM, folding and contorting, than the rocks of prior time. Their distribution is less obscure and as a result it is possible to draw conclusions concerning the probable shapes and sizes of the continents of those times, and the changes which took place in their aspects. During much of the Paleozoic, North America was connected with Europe, and South America with Africa, while North and South America

were usually separate. A great sea extended from where the Mediterranean now is, to the Pacific Ocean.

**Cambrian.** The Paleozoic era opens with the North American Continent larger than now, but partially invaded by the Cambrian seas. A narrow one stretched from Alabama to Labrador, and another from California to the Arctic Ocean. Occasionally they were joined across what is now the southwestern United States, and even spread around the Great Lakes. Their distribution is inferred from the present distribution of the sediment laid down in them, and their depths from the nature of those DEPOSITS; the finer the sediment, the further it is from shore, as a rule. The erosion of the mountain chains which outlined approximately the North American Continent provided the material for these deposits, now compacted into SEDIMENTARY ROCKS.

The fossil records left by the abundant life of those seas makes possible the correlation of strata formed in widely separated areas, even in separate continents. To supply the teeming animal life, plants must have existed in great number, but almost no plant fossils are found, probably because the vegetation was still in a low form and without woody tissue. There is no evidence of any land life.

The TRILOBITE, a crustacean faintly resembling the modern horseshoe crab, was the dominant and striking animal of the sea. Developed probably from some sort of annelid worm, they grew to considerable size, some attaining a length of two feet. Others were only a fraction of an inch in length. BRACHIOPODS, though less arresting, were also important. Some forms have persisted with little variation down to the present, and are the "lamp shells" of our seas to-day. Trails and borings of WORMS are abundant, and occasionally fossils are found showing the fine structure of the animals themselves. Lower forms of life, such as JELLYFISH, simple corals and sponges, have also left their fossils in Cambrian strata.

The slight up and down oscillations of the land that had shifted the seas finally resulted in a more widespread emergence and consequently increased erosion. There was, therefore, a cessation of sedimentation in these areas. When the seas once more spread over the land and began again to deposit sediments thereon this hiatus is recorded as a break, or unconformity, in the series of sediments. The later rocks are classed in the next, or Ordovician period. Local mountains were also thrust up, as in Vermont and Quebec, at the close of the Cambrian. Some authorities insert a new period, the Ozarkian, between the Cambrian and Ordovician. The formations appropriate to it include part of the upper Cambrian and lower Ordovician of the Mississippi Valley and Appalachian regions.

**Ordovician and Silurian.** These two periods can well be considered together, since the break between them, both from geological and evolutionary points of view, was not tremendous. Only occasionally is there an unconformity between them, as where the Taconic Mountains were raised in western New England, this disturbance being known as the Taconic Revolution.

There the folding was intense enough to metamorphose the limestones into the famous marbles of Vermont and Massachusetts. In Scotland there was an even greater deformation. Volcanic activity was great in England in the Ordovician, but unimportant in North America.

Life in the seas began to take on a more varied aspect, and previously unimportant forms became prominent. Crinoids, or "sea lilies," made their first appearance and, with the corals, the brachiopods and gastropods (represented by modern snails) became progressively diversified. GRAPTOLITES appeared, spread far and wide, and then completely vanished. They were small animals living in floating colonies as a rule, though some were attached to seaweeds or the sea bottom. Each colony was composed of cells arranged as are the teeth on a saw blade, each tooth the hard cell in which lived a member of the colony. CYSTOIDS also arose, reached their zenith and declined to a position of unimportance.

Cephalopods, to which belong the octopus and pearly nautilus of to-day, appeared and attained great size, some of their straight, conical shells being 10 feet long. Some forms developed coiled shells. Active and carnivorous, they became more and more important during these two periods, but were eventually displaced by the fishes. Not until the close of the Mesozoic, however, were they reduced to their present unimportant place. A few fish fragments are found in the Ordovician, which, though primitive, show a form already developed far from the probable ancestor, which may have been something like the modern gill-breathing, wriggling lancelet.

Preyed on in the Ordovician and Silurian by the active cephalopods, and doomed to attack in the Devonian by fishes, the trilobite was waning. The tyranny of the Silurian seas was shared by the giant cephalopods and a giant relative of the trilobite, the eurypterids. The latter, remotely related to the modern horseshoe crab, often attained a length of six feet. Remains of scorpions, also related to trilobites through an intermediate eurypteroid ancestry, have been found in Silurian rocks, and are the first recorded relics of air-breathing animals. The first meager evidences of land plants appear in the Ordovician, and such marine forms as algae and seaweed were abundant.

The partial decay, in the mud of offshore deposits, of the remains of these living forms eventually produced the important PETROLEUM deposits of Ohio and eastern Indiana. An arid climate during part of the Silurian caused the precipitation of great salt beds in what is now New York State. The Clinton iron-ore beds, formed largely of oolites of hematite, and stretching from New York to Alabama, were laid down in the Silurian, probably in shallow seas. The zinc and lead ores of Wisconsin, Iowa and Illinois occur in Ordovician formations, as do the phosphate rock deposits of Tennessee. The great limestone beds, called Niagara Dolomite, exposed in the gorge of the Niagara, are typical deposits of the time. Their resistance to erosion is responsible for Niagara Falls.

There was considerable oscillation of sea and land during these periods, the greatest flooding having covered nearly half the continent of North America. Two islands were probably present in this interior sea, persisting as important features of the continent from the middle Ordovician onward. One was about where Cincinnati is now, and the other in southern Missouri. They influenced later the courses of the Ohio and Mississippi rivers, and the location of the coal-fields of the Ohio valley, Kansas, Oklahoma and Texas.

**Devonian.** There is hardly a break in sedimentation between the Silurian and Devonian. Continued oscillation of the seas left the land now uncovered, now submerged, and in contrast with the two previous periods these seas were predominantly shallow, isolated basins. The Mississippi-Great Lakes region, northern Canada and parts of western United States were thus covered at times. The marine invertebrate life was much like that of the Silurian, but more diversified and highly developed. The striking feature was the inauguration of the reign of fishes, giving this period the name "Age of Fishes." In many re-



FROM SCHUCHERT AND LEVENE, THE EARTH AND ITS RHYTHMS. COURTESY D. APPLETON & CO.

#### TRIO OF EARLY AMPHIBIANS

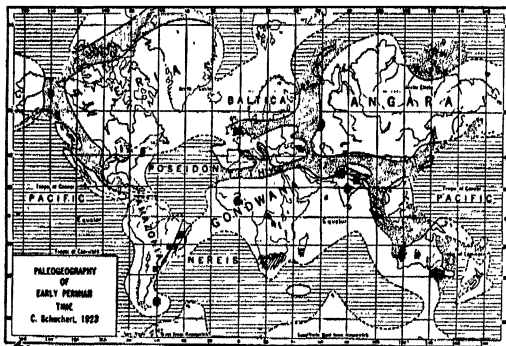
spects they differed from modern forms, some of the early ones bearing heavy, bony armor, especially about the head. Sharks and lungfishes were abundant, and the ganoids were important, especially as a branch of this stock probably gave rise to the amphibians. Typical modern fish had not yet appeared.

Life invaded the land definitely in the Devonian, and land plants, such as ferns, horsetails, club mosses and gymnosperms appear in abundance; a single amphibian footprint has been found.

Devonian strata in the eastern United States contain important petroleum and natural gas producing beds. The climate, especially toward the end, was arid, a natural result of the general emergence of the continent, and the elevation of New England and eastern Canada into the Acadian Mountains, an event to which the term "Acadian Revolution" is applied. These mountains nearly disappeared in the period of erosion which followed.

**Carboniferous.** Although the Mississippian, Pennsylvanian and Permian are granted the rank of periods, it is convenient to discuss them together under the older heading, Carboniferous. The oscillations of the surface of the land produced a renewed flooding of the central part of the continent in the Mississippian, but

drained it again toward the end of that period. This was repeated in the Pennsylvanian, but the continent by then had definitely begun to rise, and during Permian time most of North America was dry land, with an increasingly severe climate. The closing period of the Paleozoic was marked by the occurrence of an Ice Age, dominantly in the southern hemisphere.

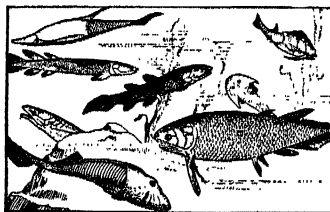


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#### PALEOGEOGRAPHY AND AREA OF KNOWN GLACIATION OF MIDDLE PERMIAN TIME

Oceans ruled, epi-continental seas dotted, places of glaciation lined (vertical lines, areas of proved glaciation; horizontal lines, of uncertain glaciation). Note the transverse shape and connected condition of the continents of this time

In the seas, the end of the trilobites and eurypterids is witnessed, but their land-living relatives, the insects, appeared. Brachipods were abundant, crinoids flourished amazingly, and one-celled foraminifera became important, but the dominant life was vertebrate, which had now definitely begun its long ascent. Of the Devonian fishes, sharks and ganoids were abundant. Amphibians were predominant, leading the migration to land, probably as a result of the drying out of ex-



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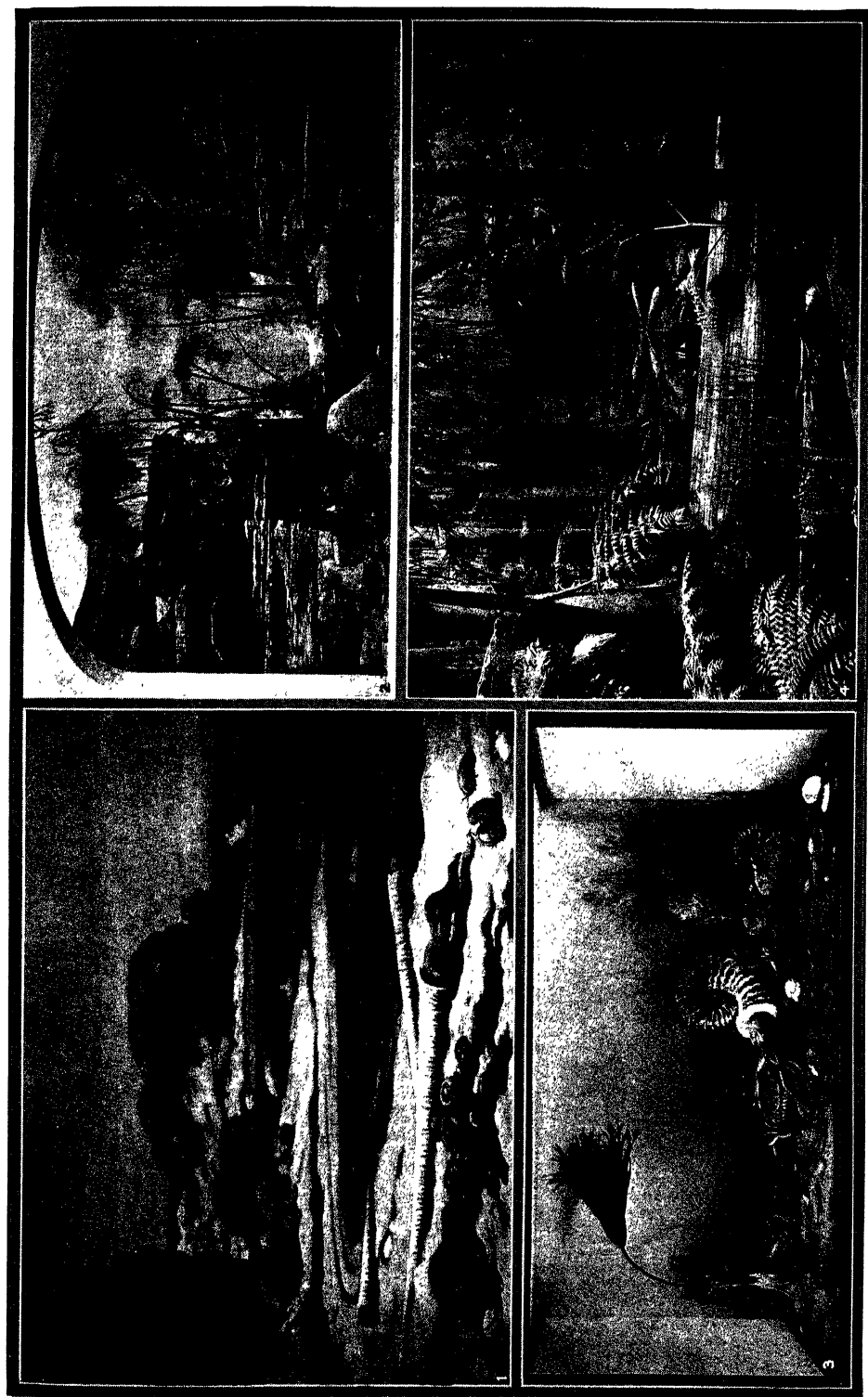
#### STRANGE FISHES OF DEVONIAN TIME

After Lucas

tensive swamps and shifting seas which forced certain of the fish to adapt themselves to changing conditions. Varying in size from a few inches to eight feet in length, some with good limbs, some almost without legs, some with boney armor, some unprotected, the amphibia were the most important form of land life.

From the amphibians, reptiles developed, more agile and better adapted to populating the dry land. Many types were in evidence, some of them with mammalian characters already foreshadowed in skull, teeth and

# PALEOZOIC



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## PALEOZOIC LIFE ON LAND AND SEA

1. Appearance of a sea beach in Ordovician time. Early forms of gastropods are seen in the foreground, with cephalopods behind them. Some trilobites are at the right. (From a painting by Charles R. Knight.) 2. Restoration of the probable appearance of a Devonian forest in what is now the state of New York. The trees are the oldest known seed ferns. 3. Life on sea bottom in Devonian time. The plant-like animal at the left is a crinoid, or sea lily. In the center is a cephalopod attacking a trilobite. The group at the right includes other trilobites, sea weeds and shells of molluscs. 4. Restoration of plant and insect life of the Pennsylvania Period. The abundant swamp vegetation of the time, including calamites, giant club mosses, Cordaites, ferns and tree ferns, formed many coal deposits of great importance to-day. A dragon fly with a wing spread of 2 feet is in the middle foreground, and a roach 3 inches long is visible on a fallen *Lepidodendron*, or giant club moss, trunk in the left foreground.



skeleton, and others which were ancestral to the dominant reptilian life of the MESOZOIC ERA.

Of the land-living insects, cockroaches and dragon flies, often of huge size, were dominant, but spiders, scorpions, centipedes and other insects flourished. In the Carboniferous occurred a great peopling of the land with primitive plants, mostly spore-bearing kinds. Modern trees and flowering plants were conspicuously absent, but great quantities of fast-growing types with soft wood, such as ferns, seed ferns, club mosses, horse-tails and gymnosperms grew in the forests and swamps of those times. Their preservation beneath the stagnant, swampy waters has given modern man COAL, his most precious fuel. Oil, gas and iron are other valuable products of the beds of this age.

At the close of the Carboniferous, the Appalachian Revolution, a stupendous geological event, took place. The sea trough which had existed throughout the Paleozoic in the Eastern United States, accumulating great thickness of sediments, was pushed above water, crumpled and folded into the Appalachian Mountains, while other mountains were forming in Arkansas and Oklahoma. Many forms of plants and invertebrates were extinguished, the continent was drained, and erosion began its leveling work, preparing for the following Mesozoic Era, and the evolution of the vertebrates.

The Paleozoic of other continents presents the same picture of shifting land and sea, of the building and destroying of mountains, and evolving and dying life, that North America portrays. A range of mountains north of the Alps, the Pyrenees, and the Urals were up-folded and up-thrusted at the end of the era. Similarly, throughout the world the climate seems, as a rule, to have been warm and equable, without seasons and without zones, although continental glaciation is known to have occurred several times and at a number of places, mostly in the southern hemisphere. See also PALEONTOLOGY; EVOLUTION; GEOLOGY.

S. F. K.

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**PALERMO**, the largest city in Sicily, situated on the northwestern coast. *Panormus*, as it was called, was conquered successively by Carthaginians, Romans, Saracens and Normans. The influence of these invaders is shown in the unusual beauty and variety of the buildings and monuments in the city. Perhaps the most outstanding structure in Palermo itself is the cathedral, which contains the fine porphyry tombs of Norman kings who were conquerors of the island. In the 12th century Capella Palatina, connected with the royal palace, are world-famous mosaics which are among the highest examples of this form of art. Not far from Palermo is the cathedral of Monreale, whose walls are richly decorated with celebrated mosaics representing Biblical subjects.

In Palermo on Easter Sunday, 1282, the uprising and resultant massacre of the French, known as the

SICILIAN VESPERS, took place, and marked an attempt by the natives to rid themselves of the domination of Charles of Anjou.

Palermo has a good harbor and is an important port. The fertile *Conque d'Oro*, a crescent-shaped district outside the city, produces oranges, lemons and agricultural products. Pop. 1931, 389,699.

**History.** On the site of the ancient city of Panormus, Palermo was originally the center of Carthaginian power in SICILY. Although conquered by the Grecian Pyrrhus in 276 B.C. it was recaptured by the Carthaginians and in 254 B.C. by the Romans. The town remained a Roman possession until 440 A.D., when it was captured by the Vandal conqueror Gaiserie. Belisarius in 535 retook it for Rome. In 835 the town was captured by the Saracens and became the Moslem capitol of Sicily. The Norman conquest and rule of Palermo in the 11th, 12th and 13th centuries was ended by the domination of Charles of Anjou in 1266. The Angevin domination terminated in 1282. From that time the fortunes of Palermo were merged with the general history of Sicily and the Sicilian kingdom.

**PALESTINE**, known as the Holy Land and lying between the Mediterranean Sea and the River Jordan, was in recent times until 1917 a political division of the province of Syria and was included within the dominions of the Turkish Empire. It was conquered by the British during the World War when Jerusalem, in Turkish hands since 1517, surrendered to General Allenby, Dec. 9, 1917. The country has since been administered by Great Britain, who appoints the high commissioner of the country, under a mandate passed by the Council of the League of Nations, July 24, 1922. This mandate took into consideration the Balfour Declaration of Nov. 2, 1917, favoring the establishment in Palestine of a national Jewish home. English, Arabic and Hebrew have been constituted the official languages of the country.

The natural and historical boundaries of Palestine run from the Eastern Desert across Mt. Hermon to the Western Litani, then to the Mediterranean Coast; the line continues on the south from the Gulf of Akaba to the Desert of Sinai. The political boundaries since 1923 include the Mediterranean on the west, the Egyptian Hedjazian territory on the south, a line running from the coast and Lake Tiberias to the Jordan on the north and, on the east, a line separating the Jordan River and the Dead Sea from TRANS-JORDAN. Palestine is about 10,000 sq. mi. in area and had an estimated population in 1930 of 843,132, excluding 103,000 nomads (last official census, 1931, gave population as 1,035,154). Of these, 588,849 are Moslems; 162,467, Jews; 82,590, Christians; and 9,226, persons of other religions. Palestine is divided politically into Northern Haifa, Southern Jaffa and the Jerusalem division. Its most important cities are JERUSALEM, with a population of about 90,000, and the lesser cities, JAFFA, HAIFA, GAZA, HEBRON, NAZARETH, BETHLEHEM and ACRE, ranging in population from 50,000 to 7,000.

Palestine is mainly an agricultural country producing wheat, barley, olives, olive oils and lentils. Sheep, goats and camels are raised in large numbers. The chief mineral resources are limestone, sandstone, gypsum and rock salt. For the fiscal year ending in 1929, the governmental revenue was approximately \$12,000,000, the exports were about \$8,000,000, the imports about \$36,000,000. Palestine has great agricultural possibilities, and a government attempt at reforestation has resulted in the planting of over 5,000,000 trees. Although only about the size of Vermont, Palestine had, in 1930, about 800 mi. of railroad, and its seaports were visited by approximately 3,000 vessels with a total tonnage of 2,000,000.

Political and legal disputes are referred to the Supreme Court of Palestine consisting of a British chief justice, another British judge and three local judges sitting as a court of appeal and as a high court of justice.

The tiny land of Palestine has had an extraordinarily complex history. The ancient Canaan of pre-Biblical days was conquered as early as 1700 B.C. by the Egyptians of the Hyksos period and was re-conquered by the Babylonians under Tiglath-Pileser about 1100 B.C. In the centuries following, the Hebrews attained an effective foothold in this ancient land and actually succeeded in creating a fairly independent monarchy that reached its climax in the prosperous reign of King Solomon. Palestine, however, as the buffer state between the great surrounding empires, fell successively into the power of Assyria, Egypt and Babylon and was finally absorbed into the Persian Empire. When Alexander the Great conquered Persia, Palestine entered on its Hellenic period under the Ptolemy and the Seleucides. The Maccabean revolt of the 2nd century B.C. gave the Hebrews another period of independence, lasting for about a century until the days of the Roman Procurators. A further rebellion of the Jews in the 1st century A.D. resulted in the destruction of Jerusalem, 70 A.D., and the effectual dispersion of the Jews. The fall of the Roman Empire was followed by the rise of Islam, the period of the Crusades and the final conquest of Palestine by the Turks in 1517. Palestine was held by the Turks until it was conquered by Great Britain in 1917 and became a British mandate. The Balfour Declaration of the same year stirred the hopes of the Zionists towards the reestablishment of a national homeland for the Jews. Progress was constant in this direction, and enormous sums of money were poured into Palestine to reestablish Jewish influence in Palestine. The Arab massacres of 1929 constituted an unfortunate set-back and indicated the necessity of bringing about harmony and cooperation between the native Arabs and the Jews.

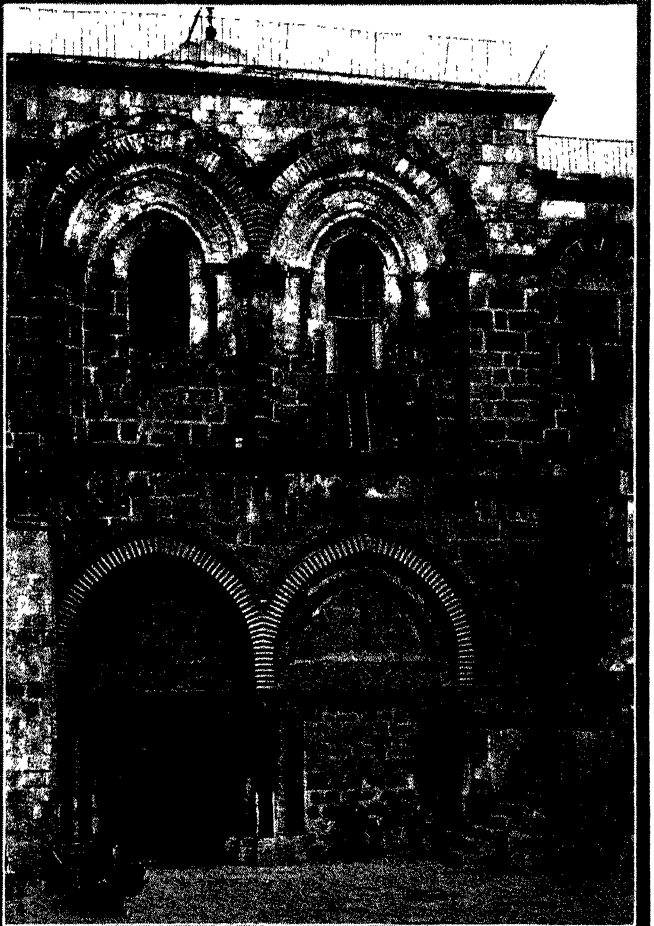
**PALESTINE**, a city and the county seat of Anderson Co., in eastern Texas, situated between the Trinity and Neches rivers, 500 ft. above sea level. It is 100 mi. east of Waco and 152 mi. north of Houston. Bus lines and two railroads serve the city; there is also an airport. Palestine is located in an agricultural district raising chiefly cotton, peaches and tomatoes. Basket,

furniture and fertilizer manufacturing, sawmilling and iron founding comprise the chief industrial activities. In 1929 the value of the manufactures was about \$2,000,000; the retail trade amounted to \$6,047,537. The natural resources include oil, gas, coal and salt, all produced in the vicinity. The city was founded about 1846 by Col. Anderson and incorporated in 1871. Ft. Houston, just outside of Palestine, was the scene of Indian fighting in the early days. Pop. 1920, 11,039; 1930, 11,445.

**PALESTINE, CAMPAIGNS IN**, a series of British operations in Asia Minor during the WORLD WAR. The campaigns had their origin in British efforts, in Feb. 1915, to protect the Suez Canal from a Turkish offensive. The defense was organized in Egypt, and the Turkish raids were successfully repulsed. The following year Lord Kitchener visited the Suez defenses, and in Mar. 1916 the Dardanelles expeditionary forces were added to the troops in Egypt, and united under Sir Archibald Murray. A Palestine attack was planned, and was preceded by the construction of roads and pipe-lines over Mount Sinai desert, east of the canal. These preparations, together with marches on El 'Arish and Rafah, delayed the Palestine campaign proper until Mar. 1917. An attack against Gaza failed; but in October Sir Edmund Allenby took Beersheba, and on Dec. 11 drove the Turks out of Jerusalem, and occupied the Holy City. Early the following year Allenby launched a series of raids east of the Jordan, and in Sept. 1918 began an offensive designed to capture the Palestine-Syrian corridor along the Mediterranean, and by wheeling east to capture Aleppo, the Turko-German base. Brilliant cavalry operations contributed materially to the perfect execution of his plan, which led to the fall of Damascus, Beirut and Tripoli. On Oct. 26, 1918, Aleppo was occupied.

**PALESTRINA, GIOVANNI PIERLUIGI DA** (c. 1525-94), Italian music composer, was born at Palestrina (whence his name) about 1525. In 1555 Pope Paul IV appointed him maestro di cappella to the Cathedral of St. John Lateran, Rome, and in 1561 he was given a similar post at Ste. Maria Maggiore, where he remained for a decade. Meanwhile, the Council of Trent, alarmed by the trivialities which had been creeping into church music, was seriously considering the banishment of polyphony from all cathedrals. To put the matter to a test, Palestrina was invited to compose a mass which should, if possible, preserve the dignity and gravity of the sanctuary and yet avail itself of the elaborations of counterpoint. This double task he performed brilliantly with three masses, the third of which, the *Missa Papae Marcelli*, satisfied papal requirements, removed the threatened ban on contrapuntal music, and caused the composer ever afterward to be known as the "savior of church music." Save for his settings of the Song of Solomon, dedicated to Pope Gregory XIII, it is perhaps the most famous of all his compositions, although nearly equal fame attaches to his *Impropria*, which are still sung every Lent in the Apostolic Chapel.

# PALESTINE



4. COURTESY CANADIAN PACIFIC STEAMSHIP CO. 3. HAMBURG-AMERICAN LINE

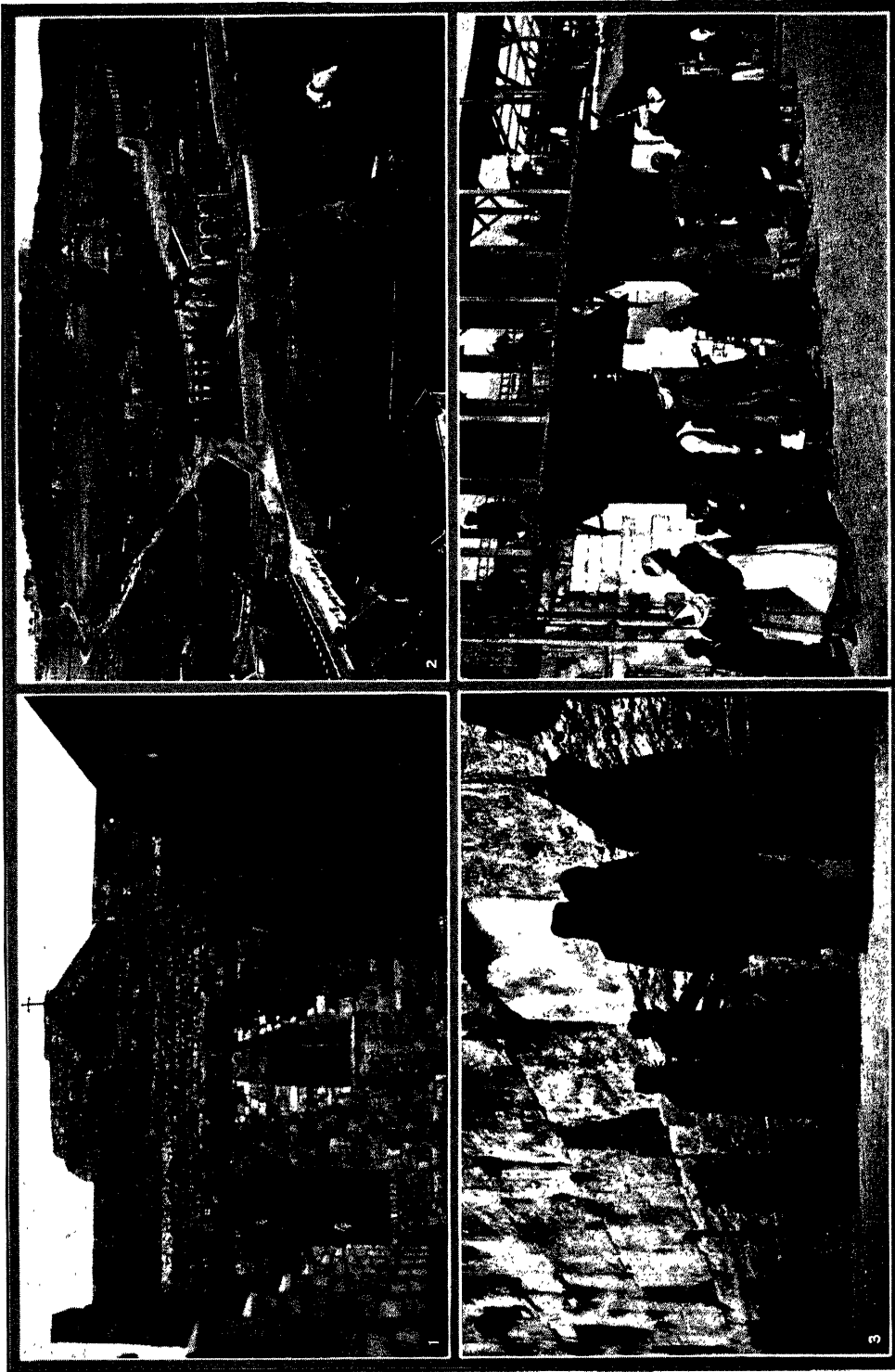
## PALESTINE IN BIBLICAL TIMES AND TO-DAY

1. Jacob's Well of the Bible, in a crypt of a Crusaders' chapel near the city of Nâbulus. 2. The Dome of the Rock, Jerusalem, once called the Mosque of 'Omar, prob-

ably erected about 691 A.D. 3. Street in Jerusalem. 4. Church of the Holy Sepulchre, Jerusalem. In its interior is the famous Holy Rock of Bible tradition.



# PALESTINE



1, 2, COURTESY CANADIAN PACIFIC STEAMSHIPS; 3, 4, HAMBURG-AMERICAN LINE

## BETHLEHEM AND JERUSALEM, THE ANCIENT BIBLICAL CITIES OF PALESTINE

1. Church of the Nativity, Bethlehem, the traditional birthplace of Christ. 2. The Mount of Olives, with the Garden of Gethsemane in the foreground.
3. The Wailing Place of the Jews. 4. Street scene in Jerusalem.



## PALESTINE

Area...9,000 sq. m.  
Pop. ....1,035,184

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

**Pop.—Thousands**  
8 Acre.....G 8  
7 Bethlehem.....N 9  
1 Bittir.....N 9  
17 Ghuzzeh.....O 2  
51 Haifa.....H 7  
18 Hebron.....O 8  
51 Jaffa.....L 5  
8 Jenin.....J 10  
90 Jerusalem.....N 10  
11 Ludd.....M 6  
17 Nablus (Shechem).....K 10  
9 Nazareth.....H 10  
4 Safed.....G 12  
4 Sefurieh.....H 10  
Shechem, see Nablus  
46 Tel Aviv.....L 5  
9 Tubariya.....H 12

## SYRIA

(Mandate)

Total Area,  
57,460 sq. m.  
Total Pop.,  
.....2,897,956

### DJEBEL DRUZE

Area...2,317 sq. m.  
Pop. ....51,780

### LATAKIA

Area...2,510 sq. m.  
Pop. ....286,920

## LEBANON

Area...3,599 sq. m.  
Pop. ....862,618

## SYRIA

Area...49,035 sq. m.  
Pop. ....1,696,638

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

**Pop.—Thousands**  
5 Baalbek.....A 18  
150 Beyrouth (Beirut).....A 12  
250 Damas (Damascus).....D 20  
6 Sour (Tyre).....E 9  
15 Zahle.....A 16

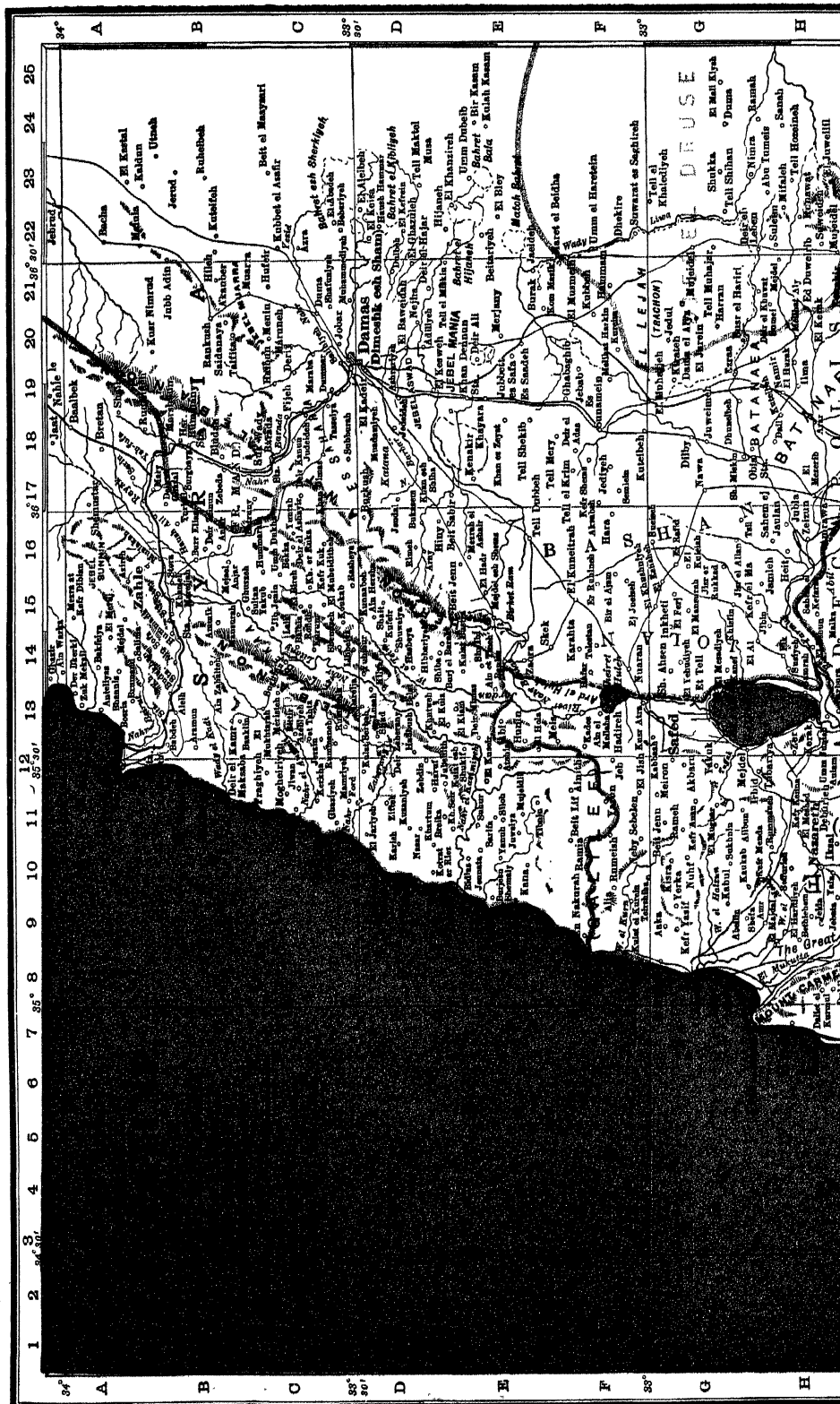
## TRANSJORDAN

Area...16,220 sq. m.  
Pop. ....300,000

### PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

**Pop.—Thousands**  
13 Amman.....M 16  
10 Es Salt.....L 14  
3 Kerak.....Q 13

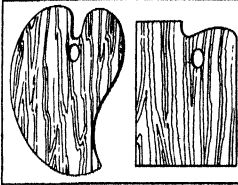






Little is known of his personal life. In 1547 he married Lucrezia di Goris who bore him two sons, and upon her death he married Virginia Dormuli. His collected works fill 32 volumes that comprise 93 masses, 250 motets, and 139 madrigals, secular and sacred. This most eminent of church composers of the 16th century died at Rome, Feb. 2, 1594.

**PALETTE**, a flat plate of porcelain or wood, usually oval in shape and provided with a thumb-hole, on which an artist lays and mixes his colors. Porcelain is used more for water-colors, wood for oils. Sometimes the word is applied to the set of colors as



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PALETTES

laid out on the palette, which is often characteristic of the individual artist. No two painters use the same assortment. Beginners are often urged to use a limited palette, such as two yellows, two reds, and two blues. Thomas Girtin (1775-1802), who founded modern water-color painting,

is said to have used a restricted palette, while J. M. TURNER, on the other hand "exhausted all the resources of the color-box." TITIAN used a vivid palette; REMBRANDT a subdued one.

**PALEY, WILLIAM** (1743-1805), English theologian and philosopher, was born at Peterborough in July 1743. He graduated from Cambridge in 1763, was ordained, and became a fellow of his college. In 1776 he retired to the rectory at Musgrave, Westmoreland, but in 1782 was chosen archdeacon of Carlisle and, 12 years later, was made prebendary of St. Paul's, London, and subdean of Lincoln. Paley had great influence in his time. He vigorously opposed the slave trade, and was liberal in his views. Among his works are *Principles of Moral and Political Philosophy*, 1785, *Horae Paulinae*, 1790, and *Natural Theology*, 1802. He died May 25, 1805.

**PALGRAVE, FRANCIS TURNER** (1824-97), English poet and critic, was born at Great Yarmouth, Sept. 28, 1824. He was educated at the Charterhouse School and at Oxford. From 1847-62 he was a fellow in Exeter College, Oxford, and from 1855 was an official in the educational department at Whitehall. In 1885 he became professor of poetry at Oxford. Palgrave published, in poetry, *Visions of England*, *Amenorthis* and *The Passionate Pilgrim*, and in 1897 his famous critical work, *Landscape in Poetry*. He is best known for his anthologies, *Golden Treasury of English Songs and Lyrics* and *Treasury of Sacred Songs*. He died in London, Oct. 24, 1897.

**PALI**, a PRAKRIT language of the Indian branch of the INDO-IRANIAN linguistic group containing the writings of orthodox BUDDHISM, its literature beginning in the 4th century B.C. and continuing in artificial form to the present time. Its original home is much disputed, but seems to have been in the Ganges Doab; and the language was probably a variety of Old Çauraseni Prakrit, though with much admixture

of dialectic forms, thus forming the Buddhist counterpart of the Brahmanical SANSKRIT.

**BIBLIOGRAPHY.**—O. Frankfurter, *Handbook of Pali*, 1883; E. Müller, *Simplified Grammar of the Pali Language*, 1884; V. Henry, *Précis de grammaire palie*, 1894; W. Geiger, *Pali Literatur und Sprache*, 1916.

**PALIMPSEST**, a piece of parchment or other writing material which has been used twice, the first writing on it having been partially scraped or erased. In medieval times, when parchment was scarce and paper unknown, it was common to use writing materials twice or even three times ("double palimpsest"). Several valuable texts have been recovered from palimpsests. A palimpsest may also be a brass memorial having earlier engravings on the side not exposed. Figuratively, the term is used of the human mind.

**PALINGENESIS**, the doctrine of rebirths. It was held by the Pythagoreans, who regarded the individual soul as a part of the one world-soul. After death the soul was reborn according to the manner in which it had previously lived, either rising or falling in its new status. Thus the soul never died, but was immortal through its rebirths. This doctrine is also known as metempsychosis.

**PALINURUS**, in classical mythology, the pilot of Aeneas's ship when it sailed from Troy. While asleep at the helm, Palinurus fell overboard and was drowned. See AENEAS.

**PALISADES, THE**, the name given to the high and apparently columniated cliffs which line the west bank of the Hudson for about 30 mi. beginning a little below Haverstraw, N.Y., and extending south to Wechawken, N.J. Basaltic trap rock known as diabase of the Triassic period has formed the Palisades. In cooling, this igneous rock assumed the appearance of a mass of polygonal pillars which make a very unusual and striking effect in 200 to 550 ft. cliffs rising almost sheer from the water's edge. The blasting of these cliffs for rock which was fast ruining their beauty was finally stopped by state legislation in 1901. The Palisades Interstate Park, a huge tract of over 47,000 acres in New York and New Jersey, was dedicated Sept. 27, 1909. It includes some of the finest sections of the Palisades, also the Harriman State Park, Bear Mountain Park, Hook Mountain, Storm King Mountain and Rockland Lake, as well as parts of the Ramapo Mountains.

The park has excellent roads, paths, hiking trails and an interesting outdoor museum. In 1930, 60,000 campers were accommodated. There are several recreation parks and playgrounds, also lakes for boating and bathing. Winter sports and winter fishing are popular features. Over 5,000,000 people visit the park annually.

A bridge spanning the Hudson between Fort Washington (178th and 179th streets) on the New York City side and Fort Lee on the New Jersey side was in 1932 the longest suspension bridge in the world. From tower to tower the bridge measures 3,500 ft. and including its approaches has a length of 3 mi.

**PALISADES PARK**, a rapidly growing borough of Bergen Co., N.J., situated on the westerly slope of the Hudson River palisades, 3 mi. west of the New Jersey terminus of the George Washington Memorial Bridge. It is served by the Erie Railroad and by trolleys and motor buses with direct connections to the 125th Street ferry of New York City. It is strictly a suburban residential community and is the home of many New York City workers. Pop. 1920, 2,633; 1930, 7,065.

**PALISSY, BERNARD** (c. 1510-89), French potter, was born at La Chapelle Biron in the province of Perigord, France, about 1510. About 1539 he set up shop as a glass stainer at Saintes. Soon after he chanced to see a white enamelled cup, probably of Chinese porcelain, which so inspired him that for sixteen years in destitute poverty he experimented to discover the secret of making white enamel. Though he did not succeed, he nevertheless produced a ware superior to any previously made in France. It was characterized by raised ornaments and a richness of color, various shades of blue, green, brown, gray and occasionally yellow. Palissy's pottery was soon famous and in great demand. For twenty-five years he worked in a studio near the Louvre in Paris, enjoying the patronage and protection of Catherine de Medici despite his Huguenot affiliations. Finally in 1588, when close to eighty years of age, he was thrown into the Bastille as a heretic and died in one of its dungeons in 1589.

**PALLA** or **IMPALLA** (*Epyceros melampus*), an antelope allied to the springbok, called also roodebok by the South African Dutch because of its reddish color. The palla occurs from Zululand far northward into equatorial Africa. An anatomical peculiarity is the absence of the dew-claws, the place of which is marked by a black spot. Only the male has horns; these are about 20 in. long, lyrate in form with an abrupt angular bend in the middle. In the winter pallas gather in large herds; in the summer these break up into separate groups of males, females and young. They roam in the woods near water, and when disturbed give alarm to all game by their shrill call.

**PALLADIO, ANDREA** (1518-80), Italian architect, was born at Vicenza, Nov. 30, 1518. He studied in Rome where he devoted himself to both the literature and the architecture of classic antiquity. Upon returning to his native city in 1547 he gained prominence by his restoration of the basilica of the *Palazzo della Ragione*, and by other important work. He followed classical forms but with adaptations of his own and with notably fine proportions. A great master of the academic style, he was in revolt against the extreme freedom in building and ornamentation which followed the Renaissance. His famous work, *Four Books of Architecture*, was published first in Venice. INIGO JONES brought out an edition in England, and it was ultimately translated into every European language. THOMAS JEFFERSON drew from the writings of Palladio the ideas which he carried out

in building the University of Virginia. Palladio died in Aug. 1580.

**PALLADIUM**, a chemical element belonging to the platinum metals, having the chemical symbol Pd and the atomic weight 106.7. It was discovered by Wollaston in 1802. It occurs in all platinum and in some nickel ores. The metal is silvery white in appearance and does not tarnish. In the finely divided or spongy state, it has the remarkable property of absorbing up to nearly 1,000 times its own volume in hydrogen gas.

**PALLADIUM**, in classical mythology, an image of PALLAS ATHENA that was supposed to protect a city as long as it was kept in a safe place. The most famous palladium was the one which was dropped from heaven by ZEUS as a gift to the Trojans. The Greeks stole it, and AENEAS carried it to Italy where it was guarded in the temple of Vesta, at Rome.

**PALLAS**, in Greek mythology, one of the names of ATHENA; in Roman mythology, MINERVA. She was called Pallas, either because she killed a giant of that name or because the word may signify virgin.

**PALLIUM**, a Catholic vestment, emblematic of the papal or the cardinal office. The pallium is a Y-shaped band, made of white wool, on which six purple crosses are embroidered. It is suspended before and behind the wearer by a center loop resting on the shoulders. Originally the ecclesiastical pallium was worn exclusively by the pope. Sometime before the Reformation one of the popes sent two such vestments to the archbishops of London and York, and it is now traditionally awarded to all metropolitan bishops.

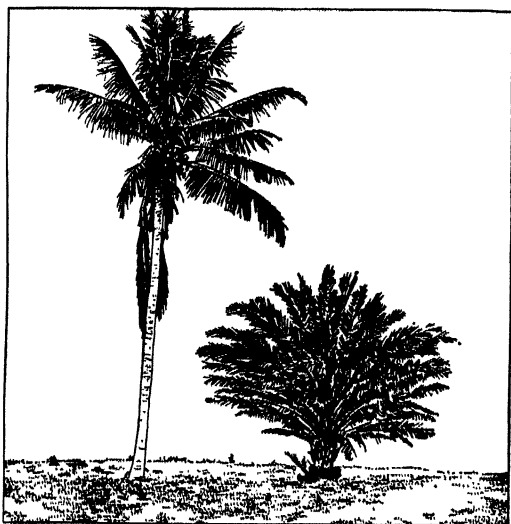
**PALL MALL** (pronounced Pell Mell), a fashionable street in London, England, noted for its palaces and mansions and as a center of club life. Originally a promenade, it became a street in the 17th century, and was named after the game of "paillemaille" or "pall mall," a kind of croquet then fashionable.

**PALM**, a plant of the *Palmaceæ* or Palm Family, known by its woody and evergreen or evergrowing character, small, more or less chafflike green or indifferently colored flowers with the parts typically in three or in multiples of three and which are showy or conspicuous only in the mass of the large inflorescences, and in technical features of the fruits. The flowers are usually very numerous, sometimes in branched clusters many feet long; these clusters may be borne among the leaves, or on the trunk below the head and less frequently above the head or crown. The palms as a class represent one of the noblest forms of vegetation. Many plants popularly called palms are not palmaceous, as the SAGO PALM which is a cycas, the YUCCA palm and the dracænas which belong to the lily family.

The true palms are inhabitants of tropical and warm temperate regions around the world, reaching great development as to number of species in the Indo-Malayan region, and in the Guiana-Brazilian territory. The number of species or kinds is not yet accurately known, but is apparently upward of 1,500

belonging to 170 or more genera. There are two general classes as to foliage, those with fan-shaped or palmate leaves and those with feather-like or pinnate leaves; these are popular distinctions, but there are intermediate forms.

Palms may be trees, shrubs or vines. Some of the kinds perish after fruiting but most species are of



COCO PALM AND YOUNG DATE PALM  
From photograph taken at Marco, Florida

indefinite duration. Many of them produce several stems or trunks from the root. A few species, as the doum or gingerbread palm of Egypt, are branched or forking although most of them bear a single top or crown terminating a continuous upright trunk. The palms in greenhouses and used in decorative work are juvenile states of large plants and they are seldom kept long enough to come into flower or fruit. They are raised from seeds, and when they begin to fail or become too large they are discarded and new plants obtained. Some of the cultivated palms, as the date, may be propagated by the suckers that naturally arise about the base of the plant.

Palms supply many needs in countries where they grow, in edible fruits (coconut, date and others), oil, wax, sugar, starch, beverages, fiber, vegetable ivory, rattan, building materials and many other parts. Some of the products are articles of extensive commerce. Young plants are grown and sold in great numbers for the florist and plant trade to be employed for decoration in homes, hotels, churches and halls. For landscape work in warm countries they supply a wide variety of sizes, shapes and aspects although frequently inartistically planted. The numbers of kinds in usual cultivation are few, however, as compared with those now known. Certain species give a tropical and striking note in mild-temperate regions even though they may require warmer temperatures for full development and vigor. Many of the extra-

tropical species, as the palmetto of the United States (*Sabal Palmetto*), withstand considerable frost.

As the palms inhabit widely unlike regions, from wet to dry and from deep shade to open sun and lowlands to mountains, so success in planting them depends primarily on the choice of species to suit the given region. Dry-land open-country species should not be expected to thrive in humid territory. The common greenhouse decorative species are kinds adapted to many and varied conditions, and they are easy to grow if given good soil and not repotted too often nor kept too wet from either over-watering or lack of drainage in the tub or pot, if well-protected or cleaned from dust and insects, and if placed where strong or drying winds and burning suns do not injure them. In street and general outdoor work, the transplanting may take place when the roots are active and soon take hold, as in spring or summer or equivalent seasons.

In Europe only one species of palm is native, being spread in the Mediterranean region; this is the *Chamærops*, a small fan palm, in many forms or botanical varieties. In the United States, from the Colorado Desert of southern California to Florida, about 20 species are native in 9 recognized genera. With the exception of the *Washingtonia* or fan palm of California and the royal of southern Florida, these are mostly low trees or bushlike, although the palmetto or cabbage-tree palm sometimes reaches a height of 75 ft. or more in the southern part of its range. Every palm country or geographical region has its own or characteristic species. With two exceptions, the genera of the Western and Eastern hemispheres are unlike, and it is not known that any species is native in both the new and the old worlds. The kinds that one sees in parks, on streets and in private grounds in various parts of the tropics are likely to have come from different parts of the world. Unfortunately many of the kinds do not have dependable common names. As a group, the palms should be popularly known and more actively appreciated. See also DATE PALM; OIL PALM; PALMETTO; PALMYRA PALM.

L. H. B.

**PALMA, RICARDO** (1833-1919), Peruvian author, was born at Lima, Feb. 7, 1833. Although he wrote much poetry, issuing three collections, between 1860 and 1870, he brought distinction to Peruvian literature chiefly with his *Tradiciones peruanas*, a long, humorous treatment of the national history that mingles the witty with the gruesome. It has been said of the fascinating collection of *Peruvian Traditions* that "if these tales are not true to history, then history should be true to them." Palma knew he political and diplomatic as well as the cultural life; during the Civil War he visited the United States and Europe. At the end of the war between Peru and Chile, in 1889, Palma was asked to organize the National Library of Peru; he performed invaluable services to this end, and was at the head of his institution up to the time of his death, Oct. 1919.



**PALMA, TOMÁS ESTRADA** (1835-1908), Cuban patriot, was born near Bayamo, Cuba, July 15, 1835. He joined the Cuban insurrection in 1868-78, and was made a general. Palma was elected President of the Republic, but in 1877 was captured and held a prisoner until after the war. Later he came to the United States where, during the second Cuban rebellion in 1895-1900 he helped the cause by furnishing munitions. He was elected President in 1901 and served until 1906. Palma died in Santiago Province, Nov. 4, 1908.

**PALMA**, a city of Spain, capital of a province of the BALEARIC ISLANDS, located on the southwest coast of the island of MAJORCA. It consists of the old city built with narrow streets on an elevation and the new city with fine streets, squares and promenades. The most prominent buildings are the Gothic cathedral, begun about 1231 and completed in 1601, the church and cloister of the former Franciscan abbey, the royal palace, the Gothic stock exchange of the 15th century, the city hall with a picture gallery, and several private palaces. The city produces cotton and silk goods, leather, gold and silver work, musical instruments and other articles. The value of the exports is double that of the imports. Est. pop. 1929, 81,336.

**PALMA Y VELASQUEZ, RAFAEL** (1874- ), Filipino educator, was born at Tondo, Manila, Oct. 24, 1874. He was graduated from Ateneo de Manila, 1891, and studied law. In 1926-28 he was an officer of internal revenue, Philippine Islands. He edited several newspapers, 1898-1904, and taught law in Escuela de Derecho, 1901-05. After serving in the Philippine Assembly, he was secretary of the Department of the Interior, 1917-20. He became president of the University of the Philippines in 1923.

**PALM BEACH**, a seaside town in Palm Beach county, southeastern Florida. It is situated on a strip of land between Lake Worth and the Atlantic Ocean, opposite West Palm Beach, and 300 mi. southeast of Jacksonville. It is served by bus lines, steamships and the Florida East Coast railroad. Palm Beach is one of the most fashionable winter resorts in the world, with many luxurious hotels, apartment houses and fine residences. Tourists began coming here for the winter in 1892. The city and West Palm Beach were seriously damaged by the West Indian hurricane of Sept. 16th, 1928. Practically all traces of this storm have been eliminated at this date. Pop. 1921, 1,135; 1930, 1,707. Estimated winter population, 7,000-15,000.

**PALM CANYON**, a narrow rocky gorge at the base of San Jacinto Mountain on the western edge of the Colorado desert. This canyon which is but 7 mi. from Palm Springs is notable for its grove of Washington palms (*Washingtonia filamentosa*) also known as California fan palm and desert palm. The grove, one of the largest in existence, grows along the course of a small stream near the entrance to the canyon and contains many trees as much as 60 ft. in height. The stately fan palm is one of 10 native species which attain the stature of a tree. It is now extensively cultivated for ornament in California, southern Europe and in other parts of the world which have a

suitably warm temperate climate, but grows wild only in the deserts of southern California and adjacent regions in Mexico. They occasionally grow in large numbers near the mouths of canyons where in addition to the novelty of a grove of palms, their brilliant green foliage forms an interesting and striking contrast to the brown arid walls of the desert canyons. Palm Canyon is the most accessible of these ordinarily out-of-the-way places, being easily reached by motor route from Whitewater railway station, or from Palm Springs.

**PALMER, ALEXANDER MITCHELL** (1872- ), American lawyer and United States attorney-general, was born at Moosehead, Pa., on May 4, 1872. He graduated from Swarthmore College in 1891, studied law, and was admitted to the bar in 1893. He entered a law partnership at Stroudsburg, Pa., which continued until the death of his partner in 1901. He practiced in Stroudsburg until 1909, when he was elected to Congress; he was twice reelected. Appointed judge of the Federal Court of Claims in 1915, he resigned the same year. From 1917-19 he was custodian of confiscated property under the "Trading with the Enemy Act," and from 1919-21 was attorney-general in President Wilson's cabinet. He used the agents of the department of justice in an energetic campaign to suppress radicalism in the country. He was active in Democratic national party politics in 1912-20, being a candidate for the Presidential nomination in the latter year. He has been for several years the senior member of a law firm in Washington, D.C.

**PALMER, ALICE FREEMAN** (1855-1902), American educator, was born at Colesville, N.Y., Feb. 21, 1855. On graduation from the University of Michigan in 1876, she taught a year at a private seminary for girls at Lake Geneva, Wis., and the following two years was principal of a high school in Saginaw, Mich. In 1879 she was appointed professor of history in Wellesley College, in 1880 was made acting president, and in 1882, when only 27 years old, president of the college. She introduced a broad curriculum and raised the standards of scholarship both in the college and for entrance requirements. On marrying GEORGE HERBERT PALMER, 1887, she gave up the presidency of the college but continued her interest in educational work. She was influential in revising the public school courses, in opening public high schools for all, 1894, and in establishing normal schools. From 1892-95 she was the non-resident dean of the University of Chicago. Mrs. Palmer died in Paris Dec. 6, 1902. In 1920 she was elected to the Hall of Fame.

See G. H. Palmer, *Life of Alice Freeman Palmer*, rev. ed. 1924; Caroline Hazard, *From College Gates*, 1925.

**PALMER, D. D.** (see CHIROPRACTIC).

**PALMER, GEORGE HERBERT** (1842- ), American scholar and writer, was born at Boston, Mass., Mar. 19, 1842. He was educated at Harvard and Tübingen universities, and studied theology at Andover Seminary. In 1873 he became assistant pro-

fessor of philosophy at Harvard, in 1883, head of the department, and in 1913 professor emeritus. His second wife was ALICE FREEMAN PALMER, president of Wellesley College. Among Palmer's publications are *The New Education*, 1887; *The Field of Ethics*, 1901; *The Teacher*, 1909, and translations of the *Odyssey* and of the *Antigone* of Sophocles. His *Life of Alice Freeman Palmer* appeared in 1908.

**PALMER**, a town including four villages in Hampden Co., southwestern Massachusetts. The village of Palmer is situated on the Chicopee River, 15 miles northeast of Springfield and is served by three railroads. The chief local manufactures are paper boxes, wire, brushes, cotton products and metal culverts. Farming is carried on. The site was settled in 1716, many of the early inhabitants being Scotch-Irish. The town was incorporated in 1775. Its townsmen took a lively part in Shay's rebellion, 1786. Pop. 1920, 9,896; 1930, 9,577.

**PALMERSTON, HENRY JOHN TEMPLE**, 3rd Viscount (1784-1865), English statesman, was born at Broadlands, Oct. 20, 1784. He was educated at Harrow and Cambridge. He entered parliament in 1807 for Newtown, Isle of Wight. In 1809 at the early age of 25 he was made secretary of war under Pitt, filling that important post during the last six years of the struggle against Napoleon and the period immediately after until 1828. Throwing in his lot with the Whigs he joined Lord Grey's ministry as secretary of foreign affairs, serving in that capacity till 1841, and wielding a powerful influence in the determination of many important European questions. At the London Conference on the Belgian question he was instrumental not only in securing the selection of Leopold of Saxe-Coburg as king but in the provision for Belgian neutrality which became a matter of such vital importance in 1914. In the Near East he supported Turkey at Constantinople and on the Nile against the ambitions of Russia. Out of office in 1841, he joined Lord Russell's ministry in 1846, sympathizing with the revolutionists throughout Europe in 1848, especially the Italians. His support of the usurpation of power of Louis Napoleon led to his resignation from the foreign office, but in 1852 he entered Aberdeen's cabinet as home secretary. Upon the fall of the Aberdeen ministry in 1855 over the question of the mismanagement of the Crimean War, Palmerston became prime minister, continuing in that office save for the brief Derby ministry, 1858-59, till 1865. As prime minister he dealt successfully with the Crimean War, cooperated with Napoleon III in the Far East, openly expressed his sympathy for the Poles in 1863, opposed the Suez Canal project and advocated British neutrality in the American Civil War. A man of great vitality and personal charm with strong prejudices and convictions, he was one of England's outstanding statesmen in the 19th century. He died Oct. 18, 1865 and was buried in Westminster Abbey. W. C. L.

**PALMERTON**, known as the Zinc City, a borough of Carbon Co., in eastern Pennsylvania, situated

21 mi. northwest of Allentown. It is served by two railroads. Palmerton lies in the beautiful Lehigh Water Gap in the Blue Ridge Mountains, surrounded by good farming country. It has large zinc works, silk factories and shirt mills. Palmerton was founded in 1898 by Stephen S. Palmer and was incorporated in 1912. The borough is a part of a tract of land received from the Indians in the famous "Walking Purchase," 1737. Pop. 1920, 7,168; 1930, 7,678.

**PALMETTO**, a genus (*Sabal*) of small trees and shrubs of the palm family sometimes called cabbage trees. There are 8 species, natives of subtropical and tropical America, 4 of which are found in the Gulf states. They are usually small trees, though some are stemless, bearing long-stalked, very large, fan-shaped leaves, exceedingly numerous flowers in compound clusters, and small black berries with a thin sweet flesh. Among the best known are the cabbage palmetto (*S. Palmetto*), a tree 40 to 50 ft. high found in Florida; the Texas palmetto (*S. texana*), a tree 30 to 50 ft. high found along the Rio Grande, and the dwarf palmetto (*S. minor*), a stemless species with leaves 2 or 3 ft. high, common along the Gulf coast. Palmetto trees are planted as ornamentals in the cities of the Gulf states, and the woody trunks are used for wharf piles. The large fleshy leaf-buds of the cabbage palmetto are used as a vegetable.

**PALMISTRY**, a system of reading character and predicting fate from the lines, prominences and specific features of the hand. It is an outgrowth of astrology, in so far as the "mounds" of the palms are assigned to the influence of the planets, in turn associated with human traits or ventures, such as Venus for the love life, Mercury for travel or business affairs, Mars for warfare or general aggressiveness, the Moon for imagination and so on. The major creases are called the life line; head line, for intellectual traits; heart line for emotional traits; fate line, etc. The shapes of hands and fingers are similarly assigned meanings. On this basis endless fanciful elaborations are introduced as indicative of traits or future events. The system is fanciful and arbitrary and has no scientific basis.

**PALMITIC ACID**, one of the three principal fatty acids occurring in oils and fats, derives its name from the fact that it is the chief constituent of palm oil. Chemically it belongs to the group of acids derived from the saturated chain hydrocarbons of which formic acid and acetic acid form the simplest representatives; its chemical formula is  $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$ . Fresh palm oil contains about 12% of free palmitic acid, the remainder being present largely as its glyceride, the chemical combination with the trihydric alcohol glycerine, known as palmitine, with admixtures of stearic and oleic acid and their glycerides. The sodium and potassium compounds of palmitic acid, together with the similar compounds of stearic and oleic acid, form the hard and soft soaps, respectively.

**PALM OIL**, one of the most important vegetable oils, is obtained from the pulpy part of the fruit of the oil palm. The fruit is bruised, or softened by ferment-

tation, and the oil at first simply pressed out by native methods, then further extracted by boiling with water. Palm oil is a liquid in the tropics, but in the temperate zone becomes a soft fat known as "palm butter," that is used in the manufacture of candles, margarine and soap. Its principal chemical constituent is palmitic acid. The oil derived from the hard kernel of the palm fruit, palm-kernel oil, is entirely different from palm oil, and more closely akin to coconut oil.

**PALM SPRINGS**, a town on the western edge of the Colorado desert in southeastern California, reached by the Southern Pacific Railroad to White-water, 9 mi. distant, or by motor road from Redlands through San Geronimo Pass. Mt. San Jacinto rises imposingly to a height of about 10,000 ft. to the west of the town. Waters from a hot spring are highly curative, and the peculiar charm of desert and mountain as well as the healthful atmosphere make Palm Springs a popular resort in the winter and spring. Pop. 1930, 417.

**PALM SUNDAY**, the Sunday before Easter. It commemorates the triumphal entry of Christ into Jerusalem, when the populace spread palm branches in his path to welcome him. Appropriate services are held in most Christian churches on this day and in Roman Catholic churches the palms, or whatever is substituted for them, are blessed and carried in procession. In the Greek Orthodox churches there is no procession, but the palms are blessed while held by the worshippers. The substitutes commonly used for the Syrian palm are branches of willow, hazel, laurel, fir, hemlock, larch and spruce. The palm early became a symbol of victory. See **ASH WEDNESDAY**.

**PALMYRA**, an ancient city in an oasis of the Syrian Desert, site of the Hebrew Tadmor. The origin of Palmyra is not known, but it was flourishing in Solomon's day. It lay on the important trade routes between Phoenicia and the Persian Gulf and between Petra and south Arabia. Caravans passing through were taxed, and in this way the city gained the greater part of its wealth. The inhabitants were chiefly Arabs, the Arab name for the city being Tadmor. The sun god Bel was worshipped there. Early in the 1st century Palmyra was under the suzerainty of Rome, but the inhabitants led by the famous Queen Zenobia tried to free themselves from this yoke in the reign of Aurelian, who conquered them and destroyed the city in 273 A.D., taking Zenobia captive.

**PALMYRA PALM** (*Borassus flabellifer*), a large palm allied to the coco de mer, called also meelalla. It is a native of tropical Africa extensively cultivated in India and Ceylon where it is one of the most useful of palms. The tree grows 60 to 70 ft. high bearing fan-shaped leaves, 8 to 10 ft. long, and large globular fruits produced in clusters. In extent and variety of usefulness the palmyra palm is exceeded by few cultivated plants. An ancient poem in the Tamil language, although mentioning 800 uses, does not complete the catalogue. The exceedingly hard, durable, black wood, which resists salt water, is employed for

piles, well-sweeps, rafters and many other purposes. From the leaves, extensively used for thatch, a kind of writing paper is made. Palmyra fiber, employed in making brushes, is obtained from the base of the leaves. Split portions of the leaves are woven into mats and baskets. The budding flower-cluster yields a sweet sap which is fermented into toddy, a strong, intoxicating drink, and is made into the form of sugar called jaggery; vinegar is also produced from it. Young seedlings are grown for the market as an article of food; they are consumed either fresh or dried and are sometimes ground into a nutritious flour.

**PALMYRENE**, an extinct SEMITIC language of the West ARAMAIC group spoken at Palmyra and preserved in a number of inscriptions dating from 100 B.C. to 300 A.D. The Palmyrenes were Aramaeans ruled by an Arabic aristocracy. The dialect of their inscriptions is interspersed with many Greek and Latin titles and technical terms, and a Greek version is often given after the Palmyrene.

**PALO ALTO**, a city in Santa Clara Co., western California, near San Francisco Bay, 28 mi. south-east of San Francisco. It is served by buses and the Southern Pacific Railroad. There is an airport and a school of aviation. Palo Alto is a residential community and educational center. It is the seat of STANFORD UNIVERSITY, a junior college, and several preparatory schools. In 1929 the retail business amounted to \$12,553,567. Senator Stanford plotted Palo Alto as a university site in 1889, on a tract of land dominated by a great redwood tree, still a landmark. The city was chartered in 1910. Big Basin State Redwood Park lies about 20 mi. south. Pop. 1920, 5,900; 1930, 13,652.

**PALO ALTO, BATTLE OF**, May 8, 1846, the first important engagement of the MEXICAN WAR. Gen. ZACHARY TAYLOR, completing his communications preparatory to his advance into Mexico, was returning from Pt. Isabel, Tex., to Ft. Brown, his base opposite Matamoras, when he encountered a Mexican force under Gen. Arista barring the road at a place called Palo Alto, nine miles from Matamoras. Taylor's force numbered 2,300 men with 10 pieces of artillery; Arista commanded 6,000 men with 10 cannon. After four hours' fighting at long range the Mexican army retired, with a loss of 600. The American casualties were 7 killed and 47 wounded.

**PALOLO WORM**, the Samoan name for members of an order (*Polychaeta*) of sea worms or annelids. There are two well-known species, one (*Leodice viridis*) found around the Samoan and Fiji islands, and the other (*Leodice fucata*) found in the Gulf of Mexico and about the West Indies. The adults live in burrows on the sea floor. When the time comes for them to spawn the back ends of their bodies, which contain the eggs or sperm, break from the front ends, and go swimming up to the surface of the ocean. There they distribute the reproductive cells through the water, and then die. The front ends of the worms, which remained behind, grow new posteriors.

The spawning of the palolo worm is controlled by the moon. In the Pacific, it occurs at the last quarter in October and November and in the Atlantic within about three days of the last quarter between June 29 and July 28. As hundreds of thousands come to the surface at the same time, the whole ocean seems to be a wiggling mass of worms. At their advent in the Pacific the natives are on hand with every sort of receptacle to scoop them from the sea, for they are considered a great delicacy. A. I. W.

**PALOOS**, a North American Indian tribe, closely related to the Nez Percé, and like them, speaking a dialect of the Shahaptian linguistic stock. They formerly inhabited the Palouse River Valley in Washington and Idaho and the north bank of the Snake to its junction with the Columbia. They now have four villages on the Snake River, Almotu, Palus, Tasawiks and Kasispa.

**PALO VERDE** (*Cercidium Torreyanum*), a small intricately branched tree of the pea family called also green-bark acacia. It is a native of southwestern deserts where it often forms, especially when in blossom, a characteristic feature of the vegetation. The tree grows 15 to 30 ft. high with a short trunk, stout branches, smooth yellow green bark and zigzag twigs bearing minute leaves, which soon wither so that the plant is leafless most of the year. The brilliant yellow flowers, borne in profuse clusters in early spring, are followed by beanlike pods.

**PAMELA**, the first modern novel in English, by SAMUEL RICHARDSON; published 1740. It is told throughout by means of letters written by the heroine to her family. Pamela Andrews, a maid-servant, is harassed by the attentions of her employer, the profligate Mr. B——, to such an extent that she has at last to take to flight. Mr. B—— follows and, protesting his love, marries the virtuous girl. The second part of the novel deals with the good Pamela's attempts to reform her husband's rakish way of living, and of her ultimate success in this. The manners and morals of the 18th century are most vividly pictured.

**PAMIRS**, the central point of the Asiatic mountain system, formed by the union of the two main lines of folded mountain ranges which stretch across southern Asia. Although the broad lands of Tibet are often referred to as the "roof of the world," more correctly that name is applicable to the still loftier dissected plateau of the Pamirs. The origin of the word *pamir* is doubtful, and the most varied interpretations have been given not only of the origin of the word but also of the character of the Pamir region. Correctly, a *pamir* is a mountain valley of glacial origin, differing in the main from other mountain valleys by its superior altitude—its floor lying from 12,000 to 14,000 ft. above sea level—and in the greater degree to which its trough has been filled up by glacial detritus and alluvium, and has thereby approximated a plain in appearance. Each *pamir* is thus characterized by a border of snow-crowned peaks, terminating in steep shingle slopes or boulder-strewn undulations lower down; rivers, streams or mountain

torrents traverse the bottoms of their valleys. Pasturage is abundant and affords excellent food for every variety of animal, but there is an almost total absence either of timber or cultivated ground.

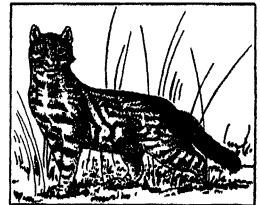
The Pamirs are rich and fertile, but because of the lack of cultivation, habitations and fuel, and from the scourge of icy blasts of the winter months they are often described as inhospitable and desolate. There are eight true Pamirs lying in an area about 150 mi. from north to south and the same distance from east to west, the peaks of the tract lying at elevations of over 20,000 ft. Almost the sole inhabitants are nomadic Kirghiz. Politically the region lies between Russian and Chinese Turkistan and Kashmir, mainly in Russian territory.

**PAMLICO SOUND**, the largest of the sea lagoons on the Atlantic coast, and part of the inland waterway which links Massachusetts with North Carolina. It lies east of North Carolina, and is separated from the ocean by long sandy islands. It is about 60 mi. long, and its greatest width is about 24 mi. It connects with Albemarle Sound on the north, and with the Atlantic Ocean via Oracoke, Hatteras and Oregon inlets, all of which are navigable.

**PAMPA**, the term for many grassy, treeless plains in South America. The Pampa, however, means a vast level expanse of grasslands, the size of Texas, in Argentina, embracing the province of Buenos Aires and parts of Santa Fé, San Luis, Cordoba, and Pampa Central. Long abandoned to primitive grazing, these fertile, prairielike lands are rapidly assuming importance for crop raising.

**PAMPA**, a city and county seat of Gray Co., situated in the Panhandle, northwestern Texas, 55 mi. northeast of Amarillo. It is served by the Santa Fé Railroad. The productive oil wells of the vicinity comprise the chief economic interest. Grain and live stock are raised in this region. It is an important shipping point for crude oil, refined oil products and many carbon black plants. The retail trade in 1929 amounted to \$12,742,911. Pop. 1920, 987; 1930, 10,470.

**PAMPAS CAT**, called also grass cat, a robust wild cat (*Felis pajero*) native to the dry grass-covered plains of Argentina and the La Plata Valley. It is the counterpart in the New World of the wild cat of Europe (*Felis catus*) and of the Pallas cat (*F. manul*) of the Asiatic steppes. Though similar to the European wild cat, the pampas cat is of stouter and more powerful build and has a much smaller head and a shorter tail. Its long fur, yellow-gray above and white below, has darker stripes running obliquely from the back across the flanks. There are bands also on the chest, legs and tail. According to W. H. Hudson, the pampas cat is "inexpressibly savage in disposition."



PAMPAS CAT

southeast course through the Culebra Cut and past the Pedro Miguel locks to its terminus in Balboa near the city of Panama. The maximum bottom width of the channel is 1,000 ft. and the minimum, encountered in Culebra Cut, is 300 ft. The six pairs of electrically operated locks, with floors and walls of concrete, are all 1,000 ft. in length and 110 ft. in width. The lock walls are 81 to 82 ft. high, and the steel gates are 65 ft. wide, range in height from 47 ft., 4 in. to 82 ft. are 7 ft. thick and weigh between 390 and 730 tons. The locks are emptied and filled by means of culverts extending through the middle and side walls. The average time for a ship to pass from BALBOA, the Pacific terminal city, to Cristobal, the terminal port on the Caribbean, is seven hours. Electric locomotives or "electric mules" tow vessels through the locks. There are breakwaters and piers 1,200 ft. in length at both terminal ports, marine repair shops, storehouses, hospitals, and hotels. Parallel with the canal on the west for much of its length is the Panama Railroad, with 47.61 mi. of tracks between Colon and Panama. Headquarters of the operating departments are located at Balboa Heights, also the residence of the governor of the PANAMA CANAL ZONE. Headquarters of the military force of 10,000 men is located at Culebra, on the west bank of the cut. Both ends of the canal are protected by heavy fortifications, in conjunction with which the army and navy maintain airplane stations. There is a submarine base on the Atlantic side. The canal and Panama Canal Zone are under the control of a governor, appointed by the President of the United States, and confirmed by the Senate; the term of office is established at four years, and the annual salary is \$10,000.

In the face of pessimistic predictions made relating to the economic and engineering practicality of the project, the operation and income of the Panama Canal since its opening, Aug. 15, 1914, have silenced its critics. While there was justification for a certain lack of public enthusiasm, because of the French abandonment of the project, the prevalence of malaria and yellow fever in the district and initial cost to the United States of \$375,000,000, the following table shows the increasing traffic, and consequently the growing usefulness, of the canal:

Fiscal Year	No. of Ships	Net Tonnage	Tolls
1915 .....	1,075	3,792,572	\$ 4,367,550
1920 .....	2,478	8,546,044	8,513,933
1925 .....	4,673	22,855,151	21,400,524
1930 .....	6,185	29,980,614	24,076,890
1931 .....	5,529	27,792,146	24,645,456

Tolls paid from Aug. 15, 1914 to June 30, 1929 amounted to \$247,511,995.

On Jan. 20, 1882, the French Panama Company, headed by Count de Lesseps, began excavation for a sea level canal, but in 1889 corrupt practices in the management forced the company into a receivership. In 1902 the United States bought out the second French Company for \$40,000,000, and the next year a treaty with Panama permitted the start of the lock

project by American engineers, headed by John F. Stevens, who was succeeded in 1907 by Col. G. W. GOETHALS. The canal was formally opened for traffic Aug. 15, 1914.

BIBLIOGRAPHY.—W. F. Johnson, *Four Centuries of the Panama Canal*, 1906; S. A. Villegas, *The Republic of Panama*, 1917; J. H. Latané, *The United States and Latin America*, 1920.

**PANAMA CANAL ZONE**, a strip of land 10 mi. wide extending in a generally northwest-southeast direction across the Isthmus of Panama, and bisected practically in the center by the Panama Canal. The United States obtained the territory from the republic of Panama under the Hay-Varilla Treaty, ratified by the United States Senate on Feb. 23, 1904. Article 2 in the treaty stipulated that "the republic of Panama grants to the United States in perpetuity the use, occupation, and control of the zone of land and land under water for the construction, maintenance, operation, sanitation, and protection of said (Panama) canal of the width of ten miles." The republic received \$10,000,000 for the concession, with annual payments of \$250,000 beginning in 1913. The Canal Zone covers a land and water area of 553.8 sq. mi., and its population in 1930 was 39,467. It is divided into the Balboa and the Cristobal districts, near the Pacific and Caribbean respectively, under control of a governor appointed by the President and confirmed by the Senate. The maximum altitude is 1,000 ft. The Panama Railroad, flanking the canal for the greater part of its length of 47.61 mi., is owned and operated by the United States Government. There is daily air service to South, Central and North America, and to Cuba. No property is privately owned but building sites and agricultural lands are leased to responsible agencies. The administrative offices of the Zone are at Balboa Heights. See PANAMA CANAL.

**PANAMA CITY**, a city and port on the northwestern coast of Florida, county seat of Bay County, situated on St. Andrew's Bay, an inlet of the Gulf of Mexico. Panama City has railroad and steamship connections. Timber is plentiful in this region, and the city has lumber mills, wood-working factories, a large craft paper mill, and naval stores retort plants. Pop. 1920, 1,722; 1930, 5,402.

**PANAMA SCANDAL**, the failure perpetrated by De Lesseps in his financial transactions in building the Panama Canal. De Lesseps's company had begun construction of a canal at Panama in 1881. After eight years of scandalous waste and mismanagement the company went into bankruptcy with a loss to shareholders of some \$250,000,000. Some years later, in 1892, deputies of the right brought up certain irregular financial relations between the French Government and the company in 1888. The matter suited the acrid mood of contemporary French party strife and was exaggerated to enormous proportions. De Lesseps and Eiffel, builder of the tower, were convicted and several deputies of the left, including Floquet and Clemenceau, were forced for the time to retire from public life.

**PAN-AMERICAN CONFERENCES**, periodical meetings of representatives of the republics of the New World to consider matters of mutual interest. The first conference, held in Washington in 1889-90, created the Commercial Bureau of the American Republics, now Pan-American Union, intended to compile and publish data helpful to inter-American commerce. Succeeding conferences were held in the City of Mexico, 1902, in Rio de Janeiro, 1906, in Buenos Aires, 1910, in Santiago, 1923, and in Havana, 1928. The tendency at recent conferences has been to broaden the scope of the discussions. Much attention has been given to the subject of INTERNATIONAL ARBITRATION.

F. M. R.

**BIBLIOGRAPHY.**—S. G. Inman, *Pan-American Conferences and their Results*, 1924.

**PAN-AMERICAN CONGRESSES.** See LATIN AMERICA.

**PAN-AMERICANISM**, the ideal of achieving the solidarity and unity of the republics of the Western Hemisphere. A basis is found in a common revolutionary origin, in their universal adoption of republican institutions, and in the problems and opportunities presented to all alike by the distinctive New World environment. See LATIN AMERICA.

**BIBLIOGRAPHY.**—G. H. Blakeslee, *The Recent Foreign Policy of the United States*, 1925.

**PAN-AMERICAN UNION**, the administrative organ of the Union of American Republics, located at Washington, D.C. It is under the management of a governing board consisting of the diplomatic representatives of the member states accredited to the government of the United States except as states elect to appoint special representatives. Its purpose is to develop closer commercial and intellectual relations, and to promote international cooperation among the 21 American republics. It publishes a monthly bulletin, collects and distributes information, and prepares the agenda of the PAN-AMERICAN CONFERENCES.

**BIBLIOGRAPHY.**—N. L. Hill, *International Administration*, 1931.

**PANAMINT** or **KOSO**, a North American Indian tribe, a division of the Shoshonean linguistic stock. Their territory was extensive and arid, comprising the Coso, Argus, Panamint and Funeral mountains and the Coso, Panamint and Death valleys. They probably never numbered more than 500. The most important item of food was the pine nut. Animal food was rarely obtainable and consisted chiefly of jack rabbits, rats, lizards and some birds. Their baskets, utensils and implements show strong Yokuts influence.

**PANCEVO** or Hungarian Pancsova, Yugoslav city in the Banat, Hungarian before 1919, on the Temeš River shortly before it joins the Danube. There are two fine squares and numerous Serbian churches in Pancevo. Silkworms and grapes are grown here and it has considerable trade in hogs, wheat and corn. Known as a trading post since the 12th century, it was destroyed several times by the Turks in the 16th century. Conquered by the Austrians in 1716,

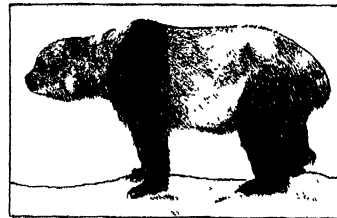
it was settled anew by Serbs and Germans who, with Hungarians, form the inhabitants. Pop. 1931, 47,050.

**PANCREAS**, a somewhat elongated, fleshy organ which lies across the front of the spinal column, behind the cavity of the abdomen and just above the level of the navel. A duct or tube from the pancreas leads to the duodenum. The pancreas has both external and internal secretions, the former being alkaline in reaction, and emptying into the small intestine, where it helps neutralize the acid contents just after they leave the stomach. The secretion also contains ENZYMES or ferments which aid in liquefying and breaking up PROTEINS. There are other enzymes that change starches and sugars (such as cane sugar and fruit sugars) into DEXTROSE. FATS and oils are also emulsified and partly saponified (see SAPONIFICATION).

The internal secretion of the pancreas comes from small islets of tissue known as the islets of Langerhans. This secretion is now known as INSULIN. It is necessary for the burning or consumption of starches and sugars by the body. Lack of this secretion causes diabetes.

Lack of the external secretion produces steatorrhea or the presence of neutral unchanged fats in the stools, and azotorrhea or the presence of undigested proteins in the bowel movements.

**PANDA**, a rare carnivorous mammal (*Elurops melanoleucus*) of the southeastern Himalayas, called also giant panda and beishung. It is allied to the raccoons and somewhat resembles a small bear in appearance and habits. The panda inhabits high forested mountains, does not hibernate, and is apparently gentle and sluggish in disposition. It is clothed in a thick, woolly coat, which is of a rich chestnut-red hue



COURTESY AMER. MUS. OF NATL. HISTORY

GIANT PANDA

on the chest, legs, belly, ears and in circular patches around the eyes; the face, neck, back and short tail are white. The first Americans or Europeans to see one alive were the brothers Theodore Roosevelt, Jr., and Kermit Roosevelt, who in 1929, after extraordinary efforts found and killed two specimens in western Szechuan, China, the skins of which may be seen mounted in the Field Museum in Chicago. A smaller panda (*Elurus fulgens*), body length 18 in. and a ringed tail as long as the body, is found in the eastern Himalayas.

E. I.

**PANDECTS** or **DIGEST**, the second part of the *Corpus Juris Citritis*, or ratification of law by the Roman Emperor Justinian. It was promulgated A.D.

533 and is made up of extracts from the writings of Roman jurists from the time of Cicero to the 3rd century A.D. It is the chief repository of Roman law and the most important source for the modern Roman law. Revised study of the Pandects in Italian Universities of the 12th century marks the beginning of modern law.

**PANDORA**, in classical mythology, the first woman. Zeus made her to torment man, because PROMETHEUS had stolen fire from heaven. The gods gave her a box containing all the ills of the world, which, when the box was opened, spread over the earth. Later legend says the box contained blessings which escaped, hope alone remaining. Zeus sent Pandora as a gift to EPIMETHEUS, the brother of Prometheus.

**PANEL**, in coal mining, one of the large blocks into which the coal in the seam is divided by ENTRIES to form a separate unit in production. Each panel has usually its own ventilating system, the outgoing air passing direct to the main return airway.

**PANELING**. See MILL WORK.

**PAN-GERMANISM**, a movement in Germany to intensify German nationalism and promote an energetic imperialist policy. It developed considerable vigor after 1894 under the leadership of Prof. Ernst Hasse, increasing its membership, improving its organization and extending its propaganda. The German nation as a whole was not attracted to the more extravagant and aggressive designs of individual Pan-Germans, but the Pan-German League won many adherents among the reactionary elements. Since the World War it has directed its efforts towards the rehabilitation of Germany as a great power. F. M. R.

**BIBLIOGRAPHY**.—M. S. Wertheimer, *The Pan-German League, 1890-1914*, 1924.

**PANGOLIN**, an endentate mammal (*Manis pentadactyla*), called also scaly anteater. It inhabits the jungles of India and the great Malay Islands, and closely related species are found in tropical Africa. Their shape is almost lizardlike, owing to a prolonged and pointed head and neck; a tapering tail as long as the body, and a short, thick neck armed with enormous claws. The whole body, in some cases 4 ft. in total length including tail, is clothed with overlapping horny scales. When in danger the animal is able to roll itself into a ball-like package which no man or leopard is able to pull open. These anteaters excavate and live in underground burrows, appearing only at night, when they wander about in search of anthills. These they tear to pieces to obtain the ants, which are their only food. See ANTEATER.

**PANICS**, actions based on emotion or instinct. The individual who is in a panicky condition has little control of his actions. The community or crowd which gets in a panicky state acts upon emotion or feeling. Such phenomena sometimes occur in conjunction with severe business crises. When panicky action does occur in a business crisis it is always in reference to bank deposits and money.

When a financial panic occurs in connection with a business crisis the public in general becomes so excited over business losses and possible financial losses that they make runs on banks. During the crisis of 1907 many depositors demanded that the banks pay them their deposits over the counter; this resulted in the failure of several banks. There has not been a financial panic in the United States since 1907 though there have been major business crises since that time.

Financial panics are the result largely of a defective banking system (see BANKS AND BANKING) or of unsound banking practices. Under the present FEDERAL RESERVE SYSTEM in the United States which provides an elastic CREDIT system, and under present strict government supervision of banking practices, the country should not be troubled with financial panics in the future, even though it may suffer serious business crises. See also BUSINESS CYCLES: CRISES. A. B. A.

**PAN-ISLAMISM**, a movement in support of the belief of Mohammedans that they should maintain a more united front in opposition to the Christian Powers of Europe. Though the idea of unity of true believers and of hostility toward unbelievers had been inherent in Mohammedanism from the beginning, it received new impetus in the 1880's when propaganda was carried on to have the Sultan of Turkey recognized by all Islam as its spiritual head, or Caliph. It was difficult, however, to win much support for the movement during the reign of Abdul Hamid II, 1876-1909. After this cruel despot was deposed, the Salonika Congress of 1911 tried to find a working program of Panislamic propaganda and resolved that a congress should be held annually to discuss the problems of Mohammedans everywhere. The fact that Persia still held aloof as a result of the old schism between Sunni and Shiah led to attempts being made to bring the two groups together. Attention again centered upon Turkey, however, when the Italian War, Sept. 1911, and Balkan War, Oct. 1912, broke out.

The World War gave Panislamism a decided setback, for their Muslim subjects proved very loyal to Great Britain, France, Russia and Italy. The losses of Turkey through the war, the establishment of a republic, Oct. 1923, which followed a self-centered nationalistic policy, and finally the abolition of the Caliphate, Mar. 1924, were blows from which the movement has found it difficult to recover. Some attempt was made to carry it on in India, and congresses were held at Mecca and at Cairo in 1926, but without much success.

**PANJANDRUM, THE GRAND**, an imaginary character who appears in a certain hodge-podge of nonsense composed by Samuel Foote, an 18th century English actor and playwright, for the purpose of testing the vaunted powers of memory of Charles Macklin, another actor. The phrase is sometimes contemptuously applied to a village potentate, or other leader among men, who happens to be somewhat ridiculous.

**PAN-LATINISM**. See LATIN AMERICA.



**PANNONIA**, an ancient district east of Noricum and north of Illyricum, with the Danube River on its north and east. Little is known of the Pannonians, but they were probably Illyrians. In 35 B.C., after his conquest of the Illyrians, Augustus succeeded in conquering them. In 12 B.C. Tiberius had a long struggle with the Pannonians, and again, from 7 to 9 A.D., when the Dalmatians joined the Pannonians. They were finally completely subdued and their country made into a Roman province. In the 5th century the district was ruled by the Eastern Empire who yielded it to the Huns. After the death of Atilla it passed to the Ostrogoths. The Langobards took Pannonia in 527 and the Avari took it from them. Charlemagne made it a part of his kingdom. In the 9th century it fell to the Hungarians.

**PANORAMIC SIGHT.** A type of telescopic (*see* TELESCOPE) sight, termed the dial sight in England, which is mounted on field GUNS. The eye-piece remains fixed, but the upper head of the sight may be turned both in azimuth and elevation, and it is provided with graduated circles and MICROMETER drums by which the line of sight may be set at any pre-assigned angle with the bore of the gun. When laying the gun directly on the target the line of sight is set parallel with the bore. When indirect laying is necessary, the angle at the gun between the target and aiming point is determined and set on the upper head of the sight. When the aiming point is brought on the cross-hairs of the sight, the gun is laid in azimuth. I. C. G.

**PANPSYCHISM**, the theory that the essence of nature is in some sense psychical rather than material. It would extend the attribute of consciousness down to the lowest orders of nature to include even the atoms and the molecules. The theory places the emphasis upon the dynamic aspects of matter and is thus in some measure a return to the old Greek theory of hylozoism. Metaphysically, panpsychism is a form of idealism.

**PAN-SLAVISM.** The central idea of most pan-Slavic writers, prior to the World War, was the promotion of a Slav national consciousness and the attainment of political solidarity among the Slav peoples scattered throughout Europe. The first outstanding Pan Slavist was a 17th century Croat named Krizanic, who still influenced Pan-Slavists in the 19th century. He advocated a political union of all Slavs under the Russian Czar, and the fostering of a Slavonic literature.

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**PANSY** (*Viola tricolor* var. *hortensis*), a favorite garden plant esteemed for the beauty of its flowers, called also heartsease. It is a familiar ornamental, long cultivated, especially in northwestern Europe. Gerard in 1587 gives a description of the pansy and Parkinson in 1629 tells of its culture in flower gardens. The modern pansy, including all of its handsome variants, is believed to have been derived from the wild heartsease (*V. tricolor*), a small weedlike

violet native to northern Europe and Asia, though other wild violets may be involved in its parentage. As commonly planted, the pansy is a perennial grown as an annual, with branching stems several inches high, very large flowers sometimes 3 in. broad, usually displaying three colors, blue, yellow and white, but varying to black and variegated.

**PANTALEONI, MAFFEO** (1857-1924), Italian economist and statesman, was born at Frascati in 1857. He studied law in Germany and at the University of Rome where in 1902 he was appointed to the chair of political economy. An uncompromising opponent of Socialism, Pantaleoni became senator in the first Fascist government. His last service was as Italian delegate to the League of Nations and as president of its committee for the restoration of Austria's finances. He died at Milan, Oct. 29, 1924.

**PANTALOON**, a favorite minor character in old Italian comedy and pantomime. He is represented as a silly, doddering old man, always appearing in spectacles, dressing gown and slippers.

**PANTHEISM**, a form of Monism, is the name usually given to any system of philosophic thought which identifies the universe with God or God with the universe. It is often expressed as, "God is All," or, "Nature is a mode of the Divine existence." The hypothesis implies the necessary and eternal coexistence of the finite and the infinite and the consubstantiality of God and nature. In the history of thought it has appeared in at least two forms, one known as Acomism, which is the higher, affirming the absorption of all things in God, a doctrine which is quite common to mystics and others of intense religious consciousness; and the second and lower form, the absorption of God in all things, which some term a form of ATHEISM. The term was first used by John Toland (1670-1722); but the views are as old as the Hinduism of the Upanishads and the Vedanta. The most outstanding pantheist in modern times was BARUCH SPINOZA, who held that the universe is explained only by reference to the single notion of God, the "One Substance." Other great thinkers who were pantheistic in tendency were GIORDANO BRUNO, who was burned at the stake for his beliefs, and, it is claimed by some, JOHN SCOTUS ERIGENA.

**PANTHEON** 1. A celebrated temple in Rome, Italy, which in its present form dates chiefly from the 2nd century A.D., when Hadrian restored it. It is circular in form and has a large, hemispherical dome rising 142 ft. above the floor. A hole 30 ft. in diameter at the apex of the roof admits light to the interior. In the 7th century the Pantheon was consecrated a Christian church. RAPHAEL and VICTOR EMMANUEL II are among the illustrious men buried within its walls. 2. The Panthéon, a famous edifice in Paris, France, was designed by Soufflot and built in 1764-90. It is laid out in the shape of a Greek cross and has a large central dome 272 ft. in height. The Panthéon is the burial place of Mirabeau, Voltaire, Victor Hugo and other distinguished Frenchmen.



**PANTOGRAPH**, an instrument for enlarging or reducing a drawing. It is a special kind of linkage. See LINKAGES.

**PANTOMIME**. Through long association the word pantomime, whether applied to a person, a play or a type of acting, has become synonymous with silence. The Greek meaning, "imitator of all," was early lost in the idea of dumb-show, but it originated at the time when the Greek mime or short, informal play had become acclimated in Rome and was performed by a single actor-dancer-singer who played in succession every part in the story. When, about 240 B.C., this protean artist discovered that he could dance and mime his successive rôles more effectively if he relegated the singing to a chorus, the Roman *pantomimus* had come into his own. From then on he performed silently, but with the aid of mask, costume, music and traditional gesture, every part in the performance. He was in turn Venus, Mars and Vulcan. Tradition has it that he could express abstract ideas and philosophic concepts by gesture alone. Pylades and Bathylus (c. 20 B.C.) were among the famous *pantomimi* whose enormous influence was one of

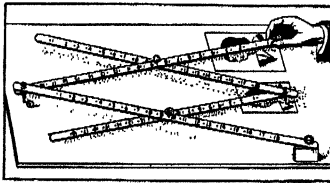
circus and the modern comedian with his fixed, mask-like expression. See MASK.

Pantomime made up a large part of the *commedia dell' arte* stock in trade. The *lazzi* were wordless scenes whose appeal never failed. English and French pantomime, stemming directly from the *commedia*, developed along very different lines. In France the *commedia* characters, driven from the legitimate theaters and silenced by the rigorous persecutions of their protected brethren, the actors of the *Comédie Française*, led a vigorous, if wordless, existence in the theaters of the fairs and the outer boulevards. Grafting native tradition on the Italian stock and developing a marked and strongly Gallic flavor of his own, Pierrot, son of Pedrolino, of Gautier-Garguille and of all the knaves and fools and *zannis* of comedy, came to life in the person of Gaspar Debureau (1796-1846), and of his son Charles. The little *Théâtre des Funambules* on the Boulevard du Temple was the scene of this rebirth of pantomime which lasted well through the 19th century.

In England dumb-show has a long history dating from pre-Elizabethan days when it was part of pageantry and of play-acting. Pantomime as known to-day was introduced in London early in the 18th century and grew with amazing speed, owing to the efforts of the Patent theaters to hold their monopoly. The smaller or "minor" theaters were forced into developing pantomime and its variations by the law which forbade all spoken drama outside the "majors"—Drury Lane and Covent Garden. Harlequin was at hand with his antics that needed no word of explanation. Reinforced by song and show, accompanied by the whole tribe of fairy story and legend, as well as by his native family of *commedia* characters, he had by the middle of the 19th century fairly usurped both major and minor stages. Dumb-show and noise have ever been popular; and pantomime in England developed an elaborate tradition and technique of its own. Rich (1692-1761) and Woodward, the famous Harlequins, Grimaldi (1779-1837), most beloved of clowns, are worthy of being classed with the greatest actors as masters of their craft.

Pantomime has not been exclusively the property of Harlequin and Pierrot. The dance has disputed with comedy the right to be considered a direct descendant of the Roman pantomime. The Duchess de Maine's *pantomime-ballet* of 1706, Noverre's *ballet-d'action* in the middle of the 18th century, and the classic ballets of France, Italy and Russia were wordless dramas interpreted by gesture, dance and song. Diaghileff in modern times developed the dance-drama still further and to-day in Europe and America serious ideas and plots are being interpreted in pantomimic dance-dramas by artists trained to an understanding of both the dance and the theater. See DANCE, THE.

Since the days when Pylades moved all Rome to tears by his silent presentation of the death of kings, pure tragedy has not been attempted in pantomime, except as it occurs inevitably as a part of the per-



COURTESY F. WEBER CO  
PANTOGRAPH, SHOWING FOUR RIGID LINKS UNIFORMLY PERFORATED

the scandals of imperial Rome. Their popularity was such that their followers rioted in the streets and the actors had to be banished to restore peace. The immense popularity of pantomime in Rome can be compared only to the passion for movies in the modern world. Possibly the universality of the language of gesture may account for both the ancient and the modern craze. "They have hands that speak," wrote Cassiodorus of the *pantomimi*, "fingers that express thought; their silence is an exclamation; they prove how far man can make known his will without the use of words."

The description might stand for every pantomimist from Livius Andronicus, who first discarded speech, to Charlie Chaplin on the silver screen. The list would include all the great clowns and mimes of the show world who rely on gesture, the expressive line of the body, attitude, movement and muscular feats to obtain their effects. For centuries the mask of the Greek and Roman stage remained, eliminating facial expression as a means of conveying emotion. The *commedia dell' arte* actors, originating in Italy and flourishing throughout Europe in the 17th century, were direct inheritors of the Latin tradition and clung for years to the mask. Harlequin wears it still, as do virtually the white-faced clown of the

formance of great actors. With the advent of the silent film an extraordinary opportunity for the development of tragic pantomime would seem to have presented itself, but so much reliance was placed on continuity and captions, so confused and incoherent were the methods of production that comparatively few great pantomimic talents were developed before the film itself was given a voice. Among that few, however, was perhaps the greatest pantomimic artist of the day, Charlie Chaplin, of whom it might be said as of Debureau and of all true pantomimes: "Here is one who said everything and who has never spoken."

R. G.

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**PAN-TURANIANISM**, a movement toward the end of the 19th century to unite all the peoples speaking a Turanian language under the rule of Turkey. These peoples included, in addition to the Turks, about 16,000,000 of the inhabitants of Siberia, Mongolia, Turkestan and the Caucasus.

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**PAOLO AND FRANCESCA**, two Italian lovers whose tragic and inspiring story, first told by DANTE in the *Divine Comedy*, has been the subject of poetic dramas by Stephen Philips, F. Marion Crawford and D'Annunzio (*see* separate articles on these authors). Giovanni Malatesta, tyrant of Rimini, occupied with government and wars, often leaves his young bride, Francesca, in the keeping of his brother, Paolo. Though Francesca and Paolo strive to keep faith with Giovanni, they are led into a sublime love which, when discovered, is the cause of their being put to death by the enraged Giovanni.

**PAPACY**, the office of the Pope of Rome; also his jurisdiction over the ROMAN CATHOLIC CHURCH. During the earlier centuries of the Christian Era, the Church was organized into five patriarchates: Rome, Constantinople, Alexandria, Antioch and Jerusalem. The MONOPHYSITE heresies, sweeping over the East in the 5th and 6th centuries, and the advance of ISLAM in the 7th century reduced the patriarchates of importance to two, namely, Rome and Constantinople; and the precedence was claimed by Rome.

**Scriptural Authority.** Fundamentally this claim was based on Scripture. In Matthew 16:18-19, it is stated that Jesus said to Simon, his chief apostle, "Thou art Peter and upon this rock I will build my Church, and the gates of hell shall not prevail against it. And I will give unto thee the keys of the kingdom of heaven; and whatsoever thou shalt bind on earth, shall be bound in heaven; and whatsoever thou shalt loose on earth, shall be loosed in heaven." According to Roman Catholic tradition, which however is not undisputed, Peter, endowed with "the powers of the keys," thus indicated, became first bishop of Rome, where, like Paul, he suffered martyrdom under Nero. By Apostolical Succession, the Pope inherits

the powers of St. Peter which are indicated by his titles, as follows: His Holiness, the Pope, Bishop of Rome and Vicar of Jesus Christ, Successor of St. Peter, Prince of the Apostles, Supreme Pontiff of the Universal Church, Patriarch of the West, Primate of Italy, Archbishop and Metropolitan of the Roman Province, Sovereign of the Vatican City.

In examining the rise of the Papacy, one must frankly dismiss as unhistorical the so-called false Decretals, fabricated during the 9th century by an overzealous monk who, assuming the name of Isidore, attributed pronouncements to early popes, many of which are spurious. Similarly, the so-called Donation of Constantine, by which that Emperor, in gratitude for his victory at the Milvian Bridge in 312, is supposed to have conferred on the Pope a spiritual supremacy over the Church Universal and over the temporal sovereignties of the Western Empire, is regarded by historians as a forgery, dating from the later years of the 8th century. It is not by such evidence that the growth of the Roman pontificate is to be explained.

Paul's Epistle to the Romans shows how important at an early date was the Church which occupied the strategic position in the capital of the Roman Empire. Early in the 2nd century, Ignatius of Antioch referred to the Roman Presbytery as "the head of the love union" of Christendom, and during the 3rd century, CYPRIAN of Carthage, while disputing certain claims of the Roman Bishop, acknowledged his succession to the Chair of St. Peter. Rome was the mother church of Christianity in Italy, Gaul and Spain, and it was from Rome that, in 597, AUGUSTINE set forth to undertake the conversion of the English. In the General Councils of the Church, the voice of Rome was decisive.

**Rival Factions.** With the emperors' removal to Constantinople, there was a throne vacant at Rome. Confronted by the Lombard invasions and other emergencies, the Popes were drawn by the people themselves into exercising a sovereignty, temporal as well as spiritual (*see* PAPAL STATES), and during the pontificate of St. GREGORY THE GREAT, 590-604, these powers were consolidated. Ritual, discipline and doctrine were duly ordered. But the victory was by no means complete. On the one hand, the patriarchs of Constantinople, supported by the Byzantine emperors, did not accept Roman jurisdiction, and differed from Rome in doctrine. In 1054 there was completed the Great Schism between the Eastern and Western churches which, despite several unions between that date and 1274, still continues. On the other hand, the authority of the popes in the West was subject to the turbulence of the Roman mob and the dictates of secular princes. At the close of the 10th century, Marozia, a lady of noble birth but of infamous reputation, was able to impose her will and her family on the Papacy with scandalous results. With three Popes claiming the Chair of St. Peter at the same time, there arose a demand for drastic reform which was met by the masterful Hildebrand

who, in 1073, became Pope Gregory VII. Not only did he secure freedom of election for the popes, but he asserted their right to determine the appointment of bishops. (See THOMAS À BECKET.) Also, he claimed a voice in approving the investiture of secular princes, and the Emperor Henry IV, thrown into opposition to the Papacy, was compelled in 1077 to undergo the humiliating Penance at Canossa, an incident the historicity of which is challenged. The ideal of a reformed but supreme Church was maintained by Pope Urban II, 1088-99, who, with flaming zeal, organized the first of the CRUSADES. Fortified by the monastic or religious orders, the popes imposed a centralized authority on the bishops and secular clergy.

The careers of Arnold of Brescia and Rienzi suggest the perpetual disorders with which, even at the height of their power, the popes were surrounded at Rome. They depended, therefore, on French assistance, and, in 1309 Clement V, a Gascon, transferred the Papal Court to Avignon, a city of Provence. This Babylonian exile, as it was called, continued until 1367 when Urban V returned to a Rome now wrecked by anarchy. In 1370 Urban thought it prudent to return to Avignon; but in 1377, his successor, Gregory XI, the last of the French popes, restored the Papal Court at St. Peter's. The election of Urban VI in 1378 was challenged, and 13 dissentient cardinals chose the anti-pope, Robert of Geneva, who assumed the style of Clement VII and resided at Avignon. The Great Schism, as it was called, continued until 1417 and divided the princes and peoples of Europe into rival factions. Both Pope and anti-pope were followed by successors, and in 1409, the Council of Pisa deposed the rivals Benedict XIII and Gregory XII, electing yet a third pope, Alexander V, who was followed by John XXIII. In 1413 the Council of Constance met to deal with a desperate situation and decided to limit the powers of the pope. John XXIII was deposed; Gregory XII resigned; and after a period of inter-regnum, Martin V was elected in 1417.

**Emergence of Protestantism.** There were now two rivals in the Church, the councils meeting at Basle and other cities and clamoring for reform, and the popes. In 1439 the Council at Florence deposed Pope Eugenius IV, and Felix V was elected in his place. The second schism was not serious, and in 1447 Nicholas V ascended the Papal Throne. The popes were now brought under the influence of the Renaissance or revival of humanist culture, during which period of grandeur, the Borgias imposed Alexander VI on the Church, 1492-1503, while the Medici popes were Leo X, 1513-21, and Clement VII, 1523-34. During this period, Germany and northern Europe, including England and Scotland, were the scene of the REFORMATION of which MARTIN LUTHER was among the pioneers. The unity of Christendom, impaired by the division of the Eastern from the Western Church, was now shattered by the emergence of PROTESTANTISM. For a time it seemed as if the

new conception of Christianity would carry all before it. But, in due course the pendulum swung from the Reformation to what is called the counter-Reformation. On the one hand, it was found that some of the evils of medieval Catholicism, for instance intolerance and political intrigue, were present also in the Protestant alternative. On the other hand, the Church set her house in order. In 1545 Pope Paul III summoned the Council of Trent, and at intervals this great body of divines sat until 1563. On the basis of papal supremacy, the council achieved and the popes enforced a salutary reorganization of the Roman Catholic Church. The recovery was stimulated by the zeal of the JESUITS. Europe was thus acutely divided between two religious impulses, apparently irreconcilable. Grim events in the struggle were the massacre of Huguenots in Paris on St. Bartholomew's Eve, 1572; the defeat of the SPANISH ARMADA in 1588 and the appalling THIRTY YEARS' WAR of 1618-48 which left central Europe in ruins.

**French Revolution.** In Rome the Popes reigned as sovereigns over the papal states. The great city, as we know it to-day, was restored, and St. Peter's with many other edifices, was completed. There was no further serious disturbance until 1789 when the FRENCH REVOLUTION opened a new era in Europe. After Bonaparte had attacked the Papal States and obtained valuable plunder of manuscripts and other treasures, the French entered and pillaged Rome in 1798, proclaimed a Republic and seized the person of Pope Pius VI, who died in 1799, a prisoner at Valence. In 1800 a conclave, held at Venice, which was Austrian territory, elected Pius VII, and the following year, a Concordat between Bonaparte and the Pope was signed. Despite his grievances, the Pope proceeded in 1804 to Paris and, at Notre Dame, participated in the coronation of Napoleon as Emperor. But the exactions of Napoleon drove the Pope to further resistance, and in 1809 the Emperor annexed the Papal States. The Pope excommunicated Napoleon and was taken prisoner to Fontainebleau. On the fall of Napoleon in 1814, the Pope returned to Rome, where, after the disturbances caused by Napoleon's return from Elba, he resumed his sway over the Papal States.

The pontificates of Leo XII, 1823-29; Pius VIII, 1829-30, and Gregory XVI, 1831-46, were comparatively speaking placid. But a revolutionary spirit was abroad in Europe, which culminated in the upheavals of 1848. For Italy, this meant the *resorgimento*, or awakening to national unity. The Pontificate of Pius IX, 1846-78, was accompanied by great changes. The Pope granted a Constitution to Rome but refused to join in war against Austria. Under Mazzini, therefore, a Republic was proclaimed, and in 1849 the Pope fled to Gaeta. He was restored in 1850 by foreign intervention; but the Papal States were lost, and it was French support alone that sustained the temporal authority of the Pope in Rome itself. In 1870 two events were recorded. The Pope proclaimed the doctrine of INFALLIBILITY, and the de-

feat of France by Germany enabled Italians to enter the Eternal City. The Pope retired to the Vatican where he assumed the rôle of prisoner. This status was maintained by Leo XIII, 1878-1903; Pius X, 1903-14, and BENEDICT XV (1914-22) who, during the World War maintained a strict neutrality.

**Treaty With Italy.** The pontificate of Pope Pius XI began in 1922. The Jubilee Year, 1925, drew an immense multitude of pilgrims to Rome; and in 1929 the Pope concluded a treaty with Italy, represented by Benito Mussolini, whereby full sovereignty of the Holy Father over Vatican City (*see* VATICAN STATE) was recognized. As compensation to the Holy See for loss of the Papal States, Italy paid 1,750,000,000 lira or somewhat more than the equivalent of \$95,000,000. By reorganizing the Vatican Library, adopting the telephone, and other modern methods of transacting business, and by using his own radio station for purposes of broadcast, Pope Pius IX impressed the world with the possibility of bringing a venerable and ecclesiastical office into touch with the life of the 20th century. P. W. W.

**PAPAGO**, a tribe of North American Indians speaking a dialect of the Piman linguistic stock. They live in southern Arizona and adjacent regions in northern Mexico. Their villages are widely scattered but are most numerous along the Santa Cruz River and in the Santa Rosa Valley. In summer the Papago raise beans and corn in the valleys, and in winter migrate to the mountains for better forage for their animals.

**PAPAL LINE OF DEMARKATION.** *See* TORDESILLAS, TREATY OF.

**PAPAL STATES**, the territories in Central Italy in which the Pope, as head of the ROMAN CATHOLIC CHURCH, exercised temporal sovereignty. During the 8th century the conquests of the Lombards were increasingly menacing, and Pope Stephen II called upon the Frankish King, Pippin the Short, to put a stop to their inroads. Pippin repulsed the Lombards in Italy in 754 and 756 and not only recognized the Pope as lord of the territories belonging to the PAPACY, but also presented him with other territories taken from the Lombards, particularly the Exarchate of Ravenna and other coast towns, thus strengthening the foundation of the Pope's temporal power, which was based on the Patrimonium Patri. The popes did not exercise complete sovereignty, which was the prerogative of the emperors; but the disunity of the Carolingian dynasty and the weakness of the later monarchs, gave the pontiffs greater freedom, especially after Pope Nicholas I. In the anarchy at the beginning of the 10th century, the papal power sank; but Otto the Great, crowned emperor in 962, increased its prestige and renewed the gifts of territory granted by the Carolingians.

At the beginning of the 11th century, the Papacy again became a tool of the Roman nobility, but was rescued by Emperor Henry III in 1047, though the temporal power was restricted for the time being to Rome and its environs. Leo IX and Nicholas II in-

creased the papal territories through diplomacy and gifts from faithful monarchs, and their successors continued their policy with success, despite the opposition of the powerful Emperor Frederick II. With the fall of his dynasty, the House of Hohenstaufen, the Pope remained victor with the Papal States entirely independent and the largest state in Central Italy.

However, the Pope's rulership was by no means assured. Throughout the entire Papal States there were partly feudal, partly municipal-republican, powers which were almost entirely independent, particularly when the popes resided at what was later, 1364, called Avignon from 1305, where they had possessed for 31 years the County of Venaissin. Their rule in Rome was also greatly endangered by the uprising under Rienzi in 1347. After 1377 Rome was again the papal residence; but the Great Western Schism, which broke out in 1378, was disadvantageous to the Papacy. Martin V, who entered Rome in 1420 after the schism, could only prepare the way for the establishment of papal sovereignty, and not until Julius II were the Papal States renewed. In 1527 Rome was conquered and plundered by imperial troops. But in the decimated states the papal rule was firmly established and Clement VII conquered extensive territories.

In the 18th century the papal power declined again, and the French Revolution put an end to it superficially. Pius VII was, indeed, reinstated by the Congress of Vienna and the Papal States were reestablished. The revolutions of 1830 and 1831 were put down with the help of Austrian and French troops. Pius IX fled from Rome in 1848 after the victory of the radical party in Rome; but foreign troops suppressed the revolution and pacified the rest of the Papal States. Finally United Italy, after the withdrawal of the French troops in 1870, made Rome the capital, and Pius became the voluntary Prisoner of the Vatican. Under direction of Pius XI, Cardinal Gasparri, Secretary of State, entered into negotiations with the Italian Government, and in Feb. 1929, he and Mussolini signed the Treaty of the Lateran which recognizes the Pope as sovereign of the State of the Vatican City. *See* VATICAN STATE in 1929.

**PAPAW** (*Asimina triloba*), a tall shrub or small tree of the custard apple family called also false banana. It grows in rich moist soil from western New York to Iowa, southward to Florida and Texas. The straight trunk, rarely a foot in diameter, grows sometimes 40 ft. high with small spreading branches and large lance-shaped leaves a foot long. The attractive flowers, green when opening and gradually



P. A. RYDBERG, "FLORA OF PRAIRIES AND PLAINS"

PAPAW  
*Asimina triloba*

changing to brown and red, bloom in early spring; the sweet edible fruit, a fleshy brown berry 3 to 7 in. long, and 1 to 2 in. thick, somewhat resembling a banana, matures in autumn.

**PAPAYA** (*Carica Papaya*), a small, soft-wooded, palmlike tree of the papaw family called also papaw. It is native to tropical America and widely grown in warm countries for its edible fruit. The tree sometimes grows 25 ft. high with an upright trunk without branches but occasionally dividing into several erect stems bearing conspicuous heads of leaves. The broad, deeply lobed leaves, almost circular in outline, are sometimes 2 ft. across. Numerous yellow flowers are borne singly or in clusters along the stem. About a year after planting the tree matures its orange-yellow, melon-shaped fruit, 8 to 20 in. long. Its pleasantly flavored flesh is widely used as a vegetable either raw or cooked. Meat placed within the green leaves and buried for a time becomes tender through the digestive action of the plant juices. From the milky juice of the unripe fruit is obtained the proteolytic enzyme papain, somewhat resembling in action pepsin and trypsin, used in the preparation of digestants. The papaya is cultivated to a limited extent in Florida.

**PAPEËTE**, capital and chief port of Tahiti, French Society Islands. It is situated on the northwestern coast and has a fine harbor. There are primary schools, a normal school and a cathedral. Papeëte is an important trading center of southern Polynesia. Cotton, coconuts, copra, mother-of-pearl, vanilla and phosphates are exported. In 1924 it had a population of 4,601, of whom nearly half were French.

**PAPER**, an aqueous deposit of vegetable fiber; also a fabric composed of vegetable fibers minutely divided and reduced by water to a smooth pulp, which is dried to form thin sheets.

Two thousand years before Christ the ancient Egyptians used writing material called papyrus. According to PLINY, the Egyptians cut the stem of the papyrus plant in thin longitudinal strips, and laid them on a flat surface side by side to the required width. Another layer of shorter strips was laid on top and at right angles, and the two layers were soaked in the water of the Nile. After being pressed the sheets were dried in the sun, and polished with ivory or a smooth shell. Papyrus rolls have been found 15 in. wide and 100 ft. long.

The Chinese are supposed to have been the first pulp and paper makers, having made paper from bamboo as early as 150 A.D. The wood was first soaked in pits of lime water. Then the fibers were separated by the impact of small stones on larger flat stones. The pulp thus made was spread out in a thin layer and dried, the result being a sheet of paper.

In 750 A.D. the Arabs conquered Samarkand, and there found a well-established paper industry. They imparted the secret of paper making to medieval Europe through the Moors who made papers in Toledo during the 11th century. From Spain the art of paper-making spread to Italy, France (1189), Germany (1390) and the Netherlands, although the facts of the

beginning of paper making in England are obscure. However, a mill is known to have been established in Hertfordshire prior to 1495, and it is certain that Huguenot immigrants from France in 1685 stimulated the English paper industry. Five years later the first paper mill was built in Germantown on the Delaware.

Prior to 1799 all paper was made by hand. In that year Nicholas Louis Robert, a Frenchman, invented the first paper machine, a crude affair, later perfected by two brothers, Messrs. Fourdrinier, of London, England. The first Fourdrinier machine was built at Bermondsey, England, in 1803. Since then, the use of this machine has become universal.

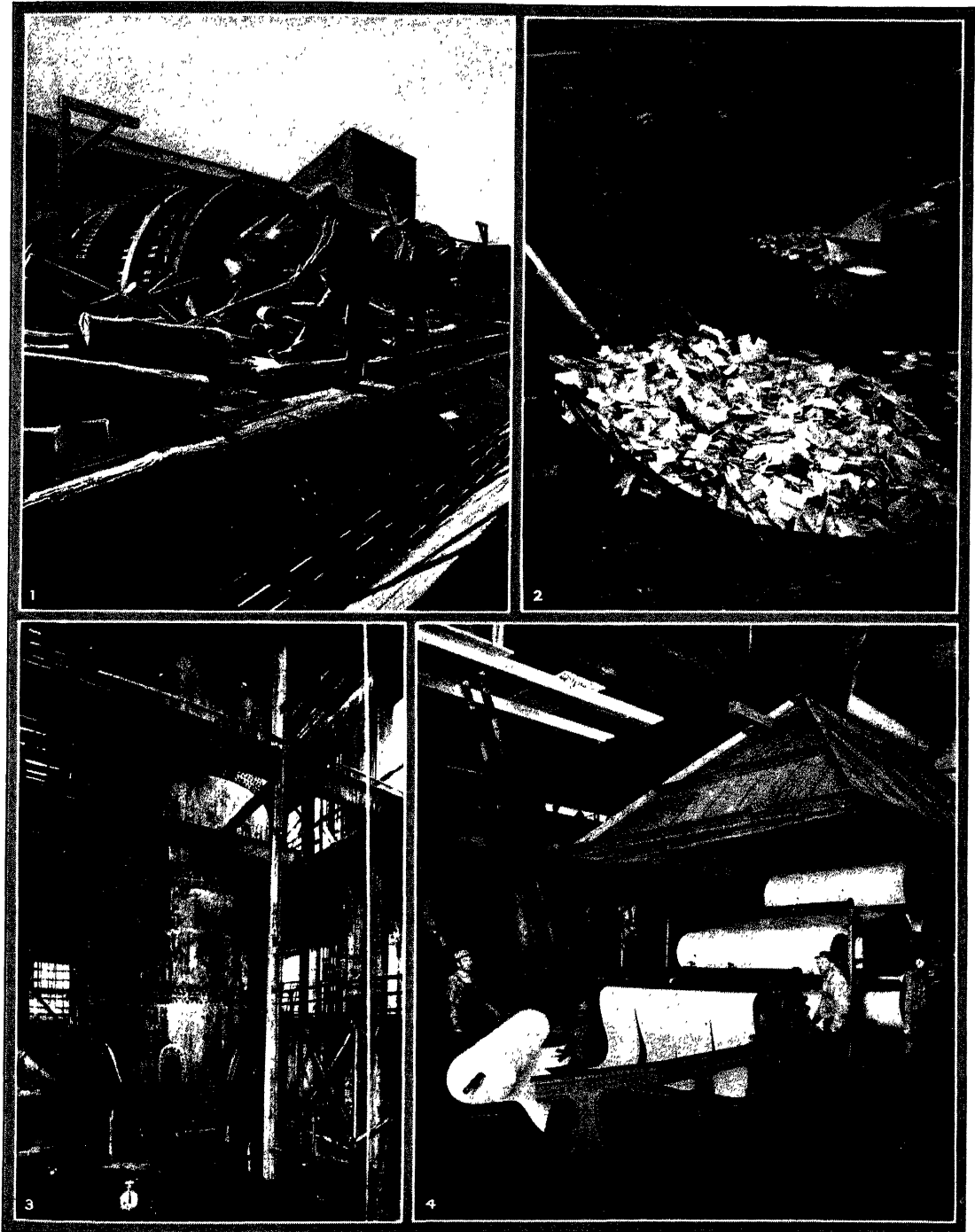
**Manufacture of Pulp.** In modern paper making pulp is manufactured from six raw products: wood; rags; rope; straw; esparto and jute butts. The woods most commonly used are spruce, fir, hemlock, poplar, birch and gum.

**Rag Pulp.** Rags come to the pulp mill in bales weighing from 300 to 600 lbs. They are of all kinds and colors; some are clean; most of them are dirty. As cleanliness of materials is essential, the rags go through a long cleaning process. When the bales are cut open, the rags are thrown into the thrasher, where rotating wooden arms dislodge the dirt, to be removed by suction. The rags are then sorted, and all buttons, hooks and eyes removed. Chopping machines cut the rags to pieces, one inch square, which are thrown into a "devil" or "whipper." There iron spikes knock out more dirt by shaking and tearing, and the rags are ready for the digesters. Digesters are huge boilers of five to ten tons' capacity in which the rags are cooked under steam in a mixed solution of lime and soda for 12 to 14 hours. When the digesters are drained, the dirty mass of pulp is shoveled into washing machines. After careful washing and bleaching, the fibers become clean and white. They are now "half stuff." In brick rooms called drainers the water and the bleaching solution are removed. After two or three weeks the fibers are ready for the first step in paper making, the beating process.

**Wood Pulp.** Wood pulp is made either mechanically or chemically. Mechanical pulp is made by grinding the wood into a fibrous condition. Pulp made by this process is weak; it has short fibers and contains much lignin. Semi-chemical pulp is made from wood that is steamed and softened before grinding. Mechanical pulp is used principally in making newsprint. Some quantities of it are used in making wrapping papers and bags.

There are four methods of making chemical pulp; the sulphite, soda, sulphate and Kraft processes. Logs are delivered to the pulp mill in four foot lengths. On an endless chain they are conveyed to the washers or barkers, which tumble the logs under constant streams of water. They are inspected after being discharged from the washers, and all rotted sections and hard knots are removed by means of splitting machines and saws. The logs are next fed into the chipping machine, where they are reduced to pieces

## PAPER



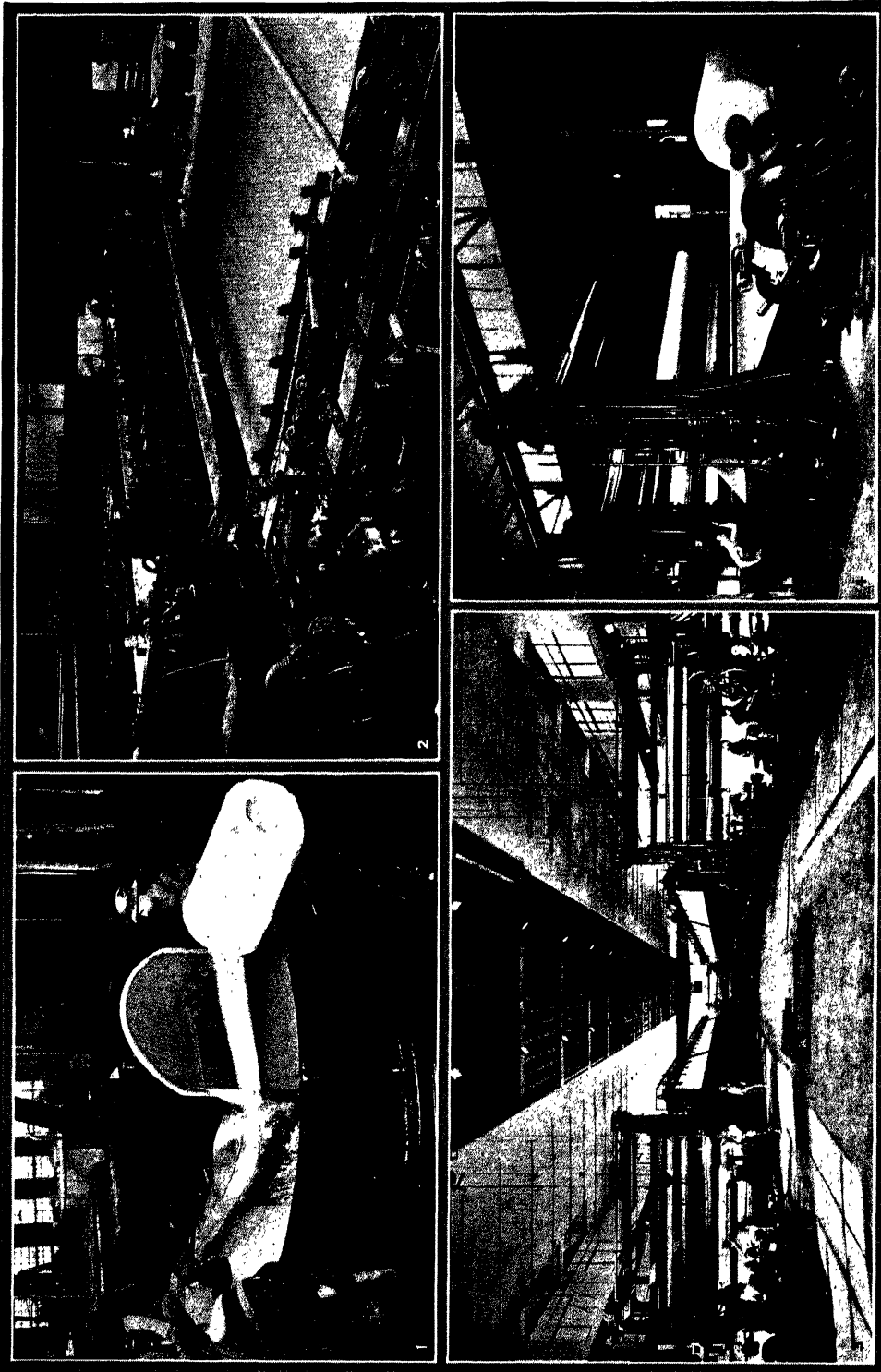
1. COURTESY INTERNATIONAL PAPER & POWER CO.; 2, 3, 4, CHAMPION COATED PAPER CO.

### CONVERSION OF WOOD INTO PAPER PULP

1. Removing the bark from the pulpwood. 2. The finished chips are about the size of a domino piece. 3. Digester in which the sulphite solution reduces the chips to pulp.

4. Dry end of the pulp machine where the pulp is wound on reels and cut into rolls, after being dried to a uniform moisture content in the machine.

# PAPER



1, 2, 4, COURTESY THE CHAMPION COATED PAPER CO.; 3, INTERNATIONAL PAPER AND POWER CO.

## PAPER MANUFACTURING PROCESSES

1. Beating engine, showing it nearly loaded with pulp and water. 2. Stock being fed onto the Fourdrinier wire by the head box and slice bars. The fibers of the paper are felted together by sidewise agitation as they travel forward on the wire at high speed. 3. Paper machine room. Calendar stack is shown at near end of room.
4. Calendar stack delivering the paper to a reel winder which winds it into a roll.

of many sizes. By careful screening the chips are sorted; large pieces go back to a thrasher, until all chips are broken to a uniform small size. An endless belt conveys the chips to a storage loft in the digester building, where they await the cooking process.

The chips are cooked in a large digester with certain chemicals under steam pressure for a period varying from seven to 11 hours until disintegrated. During this process, the lignin, fats, sugars and resins are dissolved by the chemicals in the cooking liquor, leaving unaffected and undisturbed the individual wood fibers known as cellulose. After the chips are cooked, they are discharged into the drainers. Since the pulp contains a large percentage of the cooking liquor the fibers are passed in over lines of screens in large quantities of water. Uncooked pieces of wood, bark, and other undesirable materials are held on top of the screens, and are eventually washed away. Much of the water in the pulp is removed by the "decker" or "thickener." The pulp is next bleached in large tanks, and after being washed and drained, is held in storage awaiting the beating machines. By the sulphite process coniferous woods of long fiber, including spruce, fir and hemlock, are reduced to pulp. The chips are cooked at high temperature and under pressure in bisulphite of lime. Because of the strength of sulphite fibers, they are used in making fine book papers.

By the soda process deciduous woods such as poplar, birch and gum are reduced to a pulp. These chips are cooked with a caustic soda solution which combines with the acid constituents of the non-fibrous parts of the wood, leaving pure cellulose. Soda fibers are softer, shorter and finer than sulphite fibers and are used in making book papers. Soda fibers fill in between the sulphite fibers and give a closer, more even paper formation. The sulphate and Kraft processes of pulp making are used primarily in the manufacture of wrapping and bag papers. In principle they are the same as the processes just described.

**Manufacture of Paper.** *Hand-made Paper.* Up to the beginning of the 19th century, all papers were made by hand. In England, Italy and Japan some papers are still made by hand for special art purposes. In the hand process of paper making, the prepared pulp, mixed with plenty of water, is lifted onto a piece of wire cloth stretched on a frame. The frame is shaken; so that the water drips through the wire; the pulp, left in a thin sheet on the surface, is transferred to a piece of felt, to be dried and pressed. The thickness of the paper depends on the skill of the workman.

*Machine-made Papers.* The beating process is the first step in paper making, for it is in the beating machine that the quality and kind of paper are determined. Revolving iron bars beat the fibers to the desired fineness. Here different qualities of stock are mixed together; clay is added to increase the weight of the paper and to improve its surface; coloring matter is also added to give paper its desired tint. Ultramarine, when added to pulp, makes it a clear, bright

white. If no coloring were added to pulp, the paper would be a creamy shade. In the beaters sizing is added to the paper stock. After the pulp is delivered from the beaters to the storage rooms, it is ready for the Fourdrinier paper machines. When paper stock flows from the "stuff chest" to the Fourdrinier machine, it has the consistency and appearance of milk.

Modern paper machines are capable of producing from 15 to 30 tons of paper in 24 hours. The paper of unlimited length may vary from 8 to 15 ft. in width. The making of paper begins when the stock is pumped in an even stream upon a traveling endless belt of fine wire cloth, which carries it forward at a speed varying from one in. per sec., for heavy bristol boards to nearly 10 ft. per sec. for common newsprint. As the wire cloth moves forward, it is shaken in order to interlock and mat the fibers, while the water drips through the meshes of the wire, or is drawn off by suction pumps beneath it. Thickness is determined by the amount of pulp pumped on to the travelling wire and by the speed of the wire. Along the edges of the wire run "deckle." Because of the slight leakage of pulp under the deckle straps, paper is given a rough or deckle edge.

Both book and writing paper is watermarked while the pulp is still moist and soft. It is run under a revolving wire roll, called a dandy roll. On the surface of the dandy roll are letters or designs which impress themselves on the pulp. These impressions are not obliterated by the subsequent pressing and calendering. Matted pulp too fragile to travel alone is carried on an endless belt of moist felt between a series of heavy rollers, which squeeze out more water, and deliver it to a row of steam-heated iron cylinders. At the end of 150 ft. the milk-like fluid of millions of independent delicate fibers has been transformed into a fabric that is uniform, tenacious and hard. After drying, the paper has only to pass through rolls of chilled iron, called calenders, which give it its finish.

**Kinds of Paper.** The different kinds of paper are made by using different kinds of raw materials and by varying the manufacturing processes. The major classifications are: newsprint; books; boards; wrappings; fine writings; tissue; building felts and miscellaneous. There are many finishes used in writing papers; linen, parchment and bond are most common. The names of many writing papers are descriptive of their appearance. Book papers may be divided into five groups: machine finish, which includes antique laid, antique wove, English finish, high bulk and eggshell; sized and super-calendered; coated, which includes glossy and dull coated; cover; and India.

Machine finish is a paper that requires no further operations after the paper machine. Antique is a thick, blotter-like paper, soft and not much compressed. Laid denotes certain markings on the sheet, consisting of prominent vertical watermark lines some distance apart and somewhat smaller horizontal lines much closer together. Wove paper, the ordinary machine finish type, possesses almost imperceptible, equidistant markings. English finish denotes a dull sur-



face with a velvety feel. High bulk papers are extra thick antique papers. These different finishes are made by watermarking, by rollers of different design, which press the paper while it is still moist, and by variations in the pressure applied at the calenders.

Sized and super-calendered paper is a machine finish paper which has undergone an additional process of sizing and calendering to give it a high finish. Coating mixtures are of two parts: an adhesive, which fixes it to the paper; and the body of the coating itself. STARCH and CASEIN are used as the adhesives in coating book papers, while the body of most coating materials is usually China clay, satin white or Blanc Fixe. During the coating process the web of paper passes through the coating mixture. The wet coating is spread evenly on the surface of the paper by means of brushes vibrating at right angles to the web of paper. The coating may be placed on both sides. After leaving the coating machine, the paper is exposed to a temperature of 160° F., which quickly sets and dries the coating. Subsequently the paper is super-calendered, and the heat, pressure and friction of this process give it a flat surface with a high gloss. Dull coated papers are not super-calendered after the first coating.

Cover papers may be coated or uncoated. India papers are thin, "Bible" papers. The term India is applied because it is generally thought that the first specimen of this grade came from the Far East.

H. Q. B.

**PAPER INDUSTRY, UNITED STATES.** This industry embraces the manufacturing operations carried on in connection with the paper industry proper, comprising establishments engaged primarily in the manufacture of paper and paperboard, and also those establishments devoted mainly to the production of wood pulp, the chief material used in paper mills. Statistics showing the rapid expansion of this important industry since 1899 are given in the following table.

**PAPER AND PULP MANUFACTURE, U.S., 1899-1929**

Year	No. Establishments	Wage Earners	Wages \$	Value of Products \$
1899 . . . . .	763	49,646	20,746,426	127,326,162
1909 . . . . .	777	75,978	40,804,502	267,656,964
1919 . . . . .	729	113,759	135,690,642	788,059,377
1929 . . . . .	883	128,049	173,077,781	1,206,114,305

**PAPER MONEY.** See FIAT MONEY; GREENBACKS; BANK NOTES.

**PAPER MULBERRY** (*Broussonetia papyrifera*), a medium-sized tree of the mulberry family used in the Orient and in Polynesia for making paper and tapa cloth. It is a native of China and Japan widely planted in the tropics for its fiber and in mild climates for ornament; it has run wild in various localities in the eastern United States from New York southward. The tree grows 40 or 50 ft. high with a milky juice, irregularly lobed leaves, small flowers in dense clusters and orange-red fruits. The fiber is obtained from the bark.

**PAPER NAUTILUS**, a popular name for the ARGONAUT.

**PAPER SIZES.** Few people to-day know even the most important standard paper sizes by their ancient names, and nobody uses the system of designating them. The multiplicity of sizes used now has caused dimensional specifications entirely to supplant the former method. The only value of the system is as a basis of understanding terms descriptive of book sizes, such as "Royal Octavo." Names and dimensions in inches of important sizes are: Folio 17 x 22, Medium 18 x 23, Royal 19 x 24, Cap 14 x 17.

**PAPIER MÂCHÉ**, a hard, tough substance made by mixing paper pulp with a paste and sand, chalk, clay, to form a plaster-like substance which is pressed into a mold and dried. This substance can be readily molded into a great variety of shapes. Ceramic papier mâché, composed of pulp, glue, rosin, sugar of lead, and a drying agent, is used in decorative architecture and in the manufacture of such articles as clothing models and dolls. The art of making papier mâché originated in the Orient and was introduced into Europe in the 18th century.

**PAPIN, DENIS** (1647-c. 1712), French physicist, was born at Blois, Aug. 22, 1647. In 1672 he became associated with CHRISTIAN HUYGENS and in 1681 went to England to work with Robert Boyle on problems of gases, inventing the vacuum bell, or steam digester, by which he discovered that the boiling points of liquid varies with the pressure. From 1688 to 1696 he was professor of mathematics at the University of Marburg, Hesse. In 1690 he designed a steam pump-engine operated by a piston, and built a boat driven by this pump. He died about 1712, probably at London.

**PAPINEAU, LOUIS JOSEPH** (1786-1871), Canadian statesman, spokesman of radical anti-British sentiment, and leader of the Rebellion of 1837 in Lower Canada, was born in Montreal. He was educated at the seminary of Quebec, was elected to the House of Assembly of Lower Canada in 1808 and quickly won recognition as leader of the French-Canadian party. From 1815 to 1836, with but one slight interruption, he was speaker of the House; Lord Dalhousie, denounced by Papineau as a traitor and thief in the election of 1827, refused to confirm Papineau's election to the speakership, and the end of the contest found Papineau secure in his position and the governor transferred to India. His opposition to the administration became increasingly violent and he became for a time committed to annexation to the United States. After the suppression of the Rebellion of 1837 Lord Durham issued a proclamation threatening Papineau, who had fled to the United States, with death if he should return to Canada; but after having lived in Paris from 1839 to 1847, under protection of the Amnesty Act of 1847, Papineau returned and was unmolested. He became a member of parliament, exponent of the republican demands of La Partie Rouge. In 1854 he abandoned political activity. He died Sept. 23, 1871.

**PAPINI, GIOVANNI** (1881- ), Italian writer and philosopher, was born at Florence, Jan. 9, 1881. He founded and edited the review *Leonardo* in 1904-07, and contributed to a number of succeeding reviews. In 1921 Papini's *Storia di Cristo* attained worldwide fame. Here he abandoned his original iconoclastic and skeptical position and became one of the world's "great penitents" through mystic channels. To be mentioned in this connection is his important autobiography, *The Failure*, published in 1922.

**PAPPATACI FEVER.** See SANDFLY FEVER.

**PAPRIKA**, the ripe fruit of several large-fruited species of capsicums. Seed and stems are usually removed and the dried flesh ground to a powder, which is red in color and mildly pungent in flavor. Hungarian paprika has a stronger ("hotter") taste than the Spanish variety, which is also known as pimento.

**PAPUA**, a name formerly used for the whole island of New Guinea, but in 1906 the British New Guinea became the Australian territory of Papua. It is the southeastern part of the island, separated from Australia by Torres Strait, lying wholly within the tropics, between the 5th and 12th parallels of south latitude. The total area is about 90,540 sq. mi., of which 87,786 are on the mainland of New Guinea and the remainder on groups of islands scattered along the coast. The estimated native population is 275,000 but it is not possible to give exact data because a large area of the interior is unexplored. The white population in 1931 was 1,128. Papua is administered from Port Moresby, the chief town, by a governor appointed by the Commonwealth of Australia, with executive and legislative councils. See NEW GUINEA.

A lofty and extremely rugged range of mountains runs from the northwest to the southeast; Mt. Albert Edward and Mt. Victoria are both over 13,000 ft. high, and altitudes of 10,000 ft. are not uncommon. There is a wide expanse of country at the foothills, consisting largely of swamp, drained by large rivers. Rubber, hemp, cotton, rice and coffee are grown. Copra, pearl shell, gold, osmium-iridium and copper are among the chief exports.

**PAPUAN**, a group of languages apparently forming a distinct LINGUISTIC FAMILY, spoken in New Guinea and some adjacent islands. It is as yet too imperfectly known to admit of accurate classification, but there is general agreement that it belongs neither to MALAYO-POLYNESIAN nor to AUSTRALIAN.

**PAPYROLOGY.** No writing material developed in the ancient world was so cheap or so convenient as the paper made from the pith of the papyrus reed. The process of preparation is described by Pliny (*Natural History*, 13, 68 ff). Thin strips of the pith were laid side by side and over them a second layer at right angles. The whole was then wet and worked together, faced with a paste, dried, and trimmed and polished. The result was the sheet, *charta*, usually about five inches wide by ten inches high, on whose *recto* the fibers ran horizontally in line with the usual

direction of writing. For the trade these sheets were pasted together edge to edge in rolls of 20. Writing was ordinarily across the roll, in columns. From the first century A.D., the book, *codex*, form was gradually developed.

Papyrus was in use everywhere throughout the ancient world in Greco-Roman times. A few books written upon it have been preserved in libraries in Milan, Ravenna, and Rome. Otherwise the natural process of decay was arrested only where, as at Heracleum and in the Nile Delta, the papyrus was charred by fire, or where, as once in Mesopotamia and thousands of times in Egypt, it was kept dry in the desert sands. From Egypt have come texts dating from 2500 B.C. to 996 A.D., in Egyptian, hieroglyphic, hieratic, or demotic script, Coptic, Aramaic, Hebrew and Syriac, Greek, Latin, Pahlavi, and Arabic. Of these, the Greek papyri are far the most numerous and the most important, for Greek was the official language in Egypt for 1500 years. The texts have been found in ancient dumps and in deserted houses, hidden in jars, as funerary offerings in graves, as papier mâché in mummy cases, as stuffing in mummified crocodiles. The first roll came to Europe in 1778, and during the 19th century texts found by natives began to accumulate in libraries. Scientific unearthing of papyri began with the excavations of SIR FLINDERS PETRIE at Gurob in 1889, and has been prosecuted actively, most notably by the English Egypt Exploration Fund. Great collections have been made by the British Museum, by Queen's College, Oxford, by the Louvre, by the Hofbibliothek in Vienna, by the museums in Berlin and in Cairo. Lesser collections exist elsewhere in Europe and America; in the United States may be mentioned those of the universities of Michigan, Yale, Columbia, Cornell, Wisconsin, Princeton, and California. Approximately 20,000 texts have been already published.

Among them literature is well represented. Papyrus finds have brought to light Menander, Bacchylides, Sappho, Timotheus, Callimachus, Herondas, Hyperides, Philodemus, Aristotle's *Constitution of Athens*, and many apocryphal writings of early Christianity. Almost as important for the history of civilization are the non-literary texts. Private letters and accounts abound, contracts of every type, petitions, official returns on property and inheritance, oaths, oracle consultations. More important are the administrative papers, temple records, military records, records of the land registry and the tax bureau, court records, official journals of magistrates, proclamations and decrees. There have also been found bits of propaganda, an account of the Syrian war of Ptolemy III and of the Roman prosecution of the leaders of an Alexandrine anti-Semitic movement.

The use of papyrus as a writing material was brought to an end by the introduction in the 10th century of Chinese linen paper. C. B. W.

**BIBLIOGRAPHY.**—L. Mitteis and U. Wilcken, *Grundzüge und Chrestomathie der Papyrskunde*, 1912; W. Schubart, *Einführung in die Papyrskunde*, 1918.

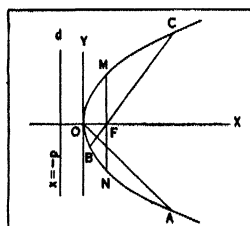
**PAPYRUS** (*Cyperus Papyrus*), a strong erect perennial plant of the sedge family, the paper reed of the ancients. It is a native of south Europe, Syria and Africa, long cultivated, chiefly in Egypt and Greece, as the source of the most important writing material in general use before the discovery of paper. The papyrus is a riverside or swamp plant, 5 to 12 ft. high, with narrow basal leaves and a large terminal flower cluster composed of numerous drooping rays. The ancient writing paper, papyrus, was made from the stems by splitting the pith into thin strips which were pressed together while wet to form sheets of varying size. Papyrus is frequently grown in aquaria and in water gardens for its striking aspect.

**PARÁ.** See BELÉM.

**PARABLE**, a short story, usually an account of some universal experience, which seeks to inculcate a moral or spiritual truth. The characters usually stand for humanity at large, for individuals or types of individuals, or even for God Himself in His relation to mankind; and the experiences through which these characters pass must be regarded as figurative. In the parable of the Prodigal Son (Luke 15), for instance, the father is God, the son is erring humanity, and the riotous living is indulgence in worldly life, the parable as a whole showing God's never-failing love and forgiveness. Sometimes, however, the parable is not allegorical, but is merely a fictitious story illustrating some lofty truth instead of allegorizing it (see ALLEGORY). The most famous parables are to be found in the four Gospels of the New Testament. K. D. S.

**BIBLIOGRAPHY.**—A. Bain, *English Composition and Rhetoric*, 1872; C. G. Lang, *The Parables of Jesus*, 1918.

**PARABOLA**, one of the CONIC SECTIONS. Its simplest equation is  $y^2 = 4px$ . In the figure the equation of the directrix,  $d$ , is  $x = -p$ . The point  $O$  is the origin  $(0, 0)$  and is the vertex of the parabola. The  $x$  axis is the axis of the parabola,  $OA$ ,  $MN$ , and  $BC$  are chords. The chords  $MN$  and  $BC$ , passing through the focus  $F(p, 0)$  are focal chords.  $MN$ , the focal chord perpendicular to the axis, is the focal width or *latus rectum*. See CONICS.



PARABOLA

**PARABOLOID**, a solid, or in modern geometry a surface, generated by the revolution of a parabola about its axis. More generally, a surface whose equation is  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2cz$ , in which the  $xy$  contour made

by the plane  $z = k$  is the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2ck$ , this being called an elliptic paraboloid. We may also have the equation  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2cz$ , which leads to a hyperbolic paraboloid, the contours being hyperbolas. See SOLIDS; ELLIPSOID; HYPERBOLOID.

**PARACELSUS, THEOPHRASTUS BOMBAST VON HOHENHEIM** (1493-1541), Swiss physician and chemist, was born near Einsiedeln in the canton Schwyz. He studied at Basel, and then traveled to Würzburg where he studied with Trithemius. When he was 22 years of age, Paracelsus joined the workers in the silver mines and laboratories in Tirol. He traveled extensively, serving as army surgeon or physician in Denmark and in Sweden, visiting England, France and Belgium, and participating in the wars in the service of Venice from 1521-1525. He visited or attended various universities in all of these countries and somewhere he seems to have obtained the title of doctor, but this was not conferred upon him by any university, although some historians insist that he acquired this degree at Ferrara. The writings of Galen and Avicenna meant nothing to Paracelsus, who relied solely upon his own experience. The facts of his life were dramatic. In all his writings and lectures, Paracelsus indicated his desire to promote the progress of medicine. He fought the faulty medical beliefs of his time, advanced pharmacy and treated diseases with scientific remedies, many of which, like opium, iron, arsenic and mercury, have remained in use to our times. Paracelsus is the hero of a long psychological poem written by ROBERT BROWNING and published in 1835.

M. F.

**PARACHOR**, a term essentially denoting the molecular volume of a liquid corrected for surface tension effects, hence "parachor" (Greek, "by the side of space"). It is the value of the function  $M\gamma^{1/3}/(D-d)$ , where  $M$  is the molecular weight,  $\gamma$  the surface tension,  $D$  the density of the liquid and  $d$  the density of its vapor.

**PARACHUTE**, a large umbrella-like device for reducing the speed of a body falling freely through the air so that it can alight safely. Man-carrying parachutes consist of a canopy, or "sail," provided with suspension cords and a harness for holding the passenger. The sail is usually circular, about 24 feet in diameter, of a light silk cloth, and made with a hole at the center. The suspension cords, usually about 24, extend from the outer edge of the sail to the point or points where the harness is attached.

The most modern parachute is of the so-called "free-fall" type. When not in use, it is folded into a snug "pack" and secured by straps to the body of the person who is to use it. They may be used as seat cushions, or may be carried on the back or in the lap. The user jumps clear of his craft and then causes the parachute to open by pulling a "releasing" handle. The shock on alighting is about that of a 6 to 10 foot jump.

The first successful parachute drop was made by Jules Garnerin in France, Oct. 22, 1797. S. Tr.

**PARADISE LOST**, an epic in 12 books by JOHN MILTON; published 1667. Milton's greatest poem, and undoubtedly the greatest single poem in English, *Paradise Lost* is a sublime history of the Fall of Man, written in stately blank verse. For convenience the



# PARAGUAY

Area. 178,700 sq. m.  
Pop. .... 933,330

## PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands	
9	Acahay.....8
13	Ajos.....09
10	Altos.....N7
7	Arroyos y Esteros.....N8
86	Asuncion.....N7
7	Ayres.....N7
10	Belén.....K7
7	Caaguazú.....09
8	Caapucú.....P7
14	Caazapa.....P9
10	Caraguatay.....N8
14	Carapegua.....07
6	Guazú-cua.....Q6
8	Hiaty.....08
15	Itá.....N7
9	Itapé.....08
7	Itauguá.....N7
14	Luque.....N7
8	Mbocayaty.....09
11	Paraguarí.....07
6	Piribé.....N8
10	Quilindí.....P7
6	Quilicó.....P8
7	San Ignacio.....07
8	San José.....08
10	San Juan Bta. Mnes.....Q6
13	San Pedro del Paraná.....Q9
6	Santiago.....02
10	Tapy.....08
6	Valenzuela.....08
13	Villa Concepción.....K7
7	Villa del Pilar.....Q6
9	Villa Encarnación.....R9
30	Villa Hayes.....N7
12	Villa Humada.....Q5
7	Villa Oliva.....P6
30	Villa Rica.....09
9	Villeta.....07
9	Yaguarón.....07
8	Yhacanguazú.....P8
12	Yuty.....Q9

# URUGUAY

Area. 72,153 sq. m.  
Pop. .... 1,903,083

## PRINCIPAL CITIES

(Including Figures from Latest Population Estimates)

Pop.—Thousands	
8	Artigas.....J25
8	Canelones.....N19
9	Carmelo.....N15
6	Chamizo.....N19
9	Colonia.....O15
14	Durazno.....L18
14	Florida.....N19
7	Fray Bentos.....L14
5	Isla Mala.....N18
6	Libertad.....O18
5	Maldonado.....P21
12	Melo.....J23
30	Mercedes.....L15
5	Migues.....O20
28	Minas.....N21
600	Montevideo.....P19
5	Mosquitos.....P20
37	Paysandú.....J15
8	Pueblo Solís.....O20
8	Rivers.....O21
12	Rocha.....O23
9	Rodriguez.....O18
11	Rosario.....O16
35	Salto.....H16
7	San Carlos.....P21
9	San Eugenio.....E19
8	San Fructuoso.....H19
6	San Gregorio.....J20
14	San José.....O18
7	Sauce.....O19
6	Soriano.....L14
9	Tala.....O20
8	Treinta y Tres.....L23
7	Trinidad.....M18
14	Union.....P19



RAND McNALLY  
POPULAR MAP OF  
**URUGUAY**

SCALE 1:3,802,000  
1 inch = 80 Statute Miles  
1 Centimeter = 38 Kilometers  
Statute Miles

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poem may be divided into three sections of four books each. The first four books set the majestic tone of the whole and describe the chagrin of Satan and the fallen angels who have been thrust out of Heaven for their disobedience; in a consultation they plot against God, at whom Satan wills to strike through the newly created Man; Book IV ends with Satan tempting Eve in a dream. Books V to IX contain the story of the war in Heaven, of Satan's fall and of the creation of the world, as told by the archangel Raphael to Adam, whom he has been sent by God to admonish. The last four books deal with the Temptation and the ultimate Fall of Man, the expulsion from Eden and, at the end, forecast the Redemption through Christ. *Paradise Lost* is majestic in design and in the expression of that design. It is ranked as the only true modern epic in English, and the nobly sustained music of its verse has never been surpassed. The poem was followed by the relatively inferior *Paradise Regained* in 1671.

**PARAFFIN COMPOUNDS**, the name given to the saturated series of aliphatic hydrocarbons, having the empirical formula of  $C_nH_{2n+2}$ . METHANE,  $CH_4$ , is the first member of the series and then follows ETHANE,  $H_3C-CH_3$ ; PROPANE,  $H_3C-CH_2-CH_3$ ; BUTANE,  $H_3C-CH_2-CH_2-CH_3$ , etc., all of which are straight chain carbon compounds. Butane and the members above it form branched carbon chains and give innumerable isomeric derivatives. The longest straight chain compound prepared is tetrahexacantane,  $C_{64}H_{130}$ . The main sources of these compounds are PETROLEUM, COAL TAR distillates and hydrogenation of coal. Special methods may be used to prepare individual members, used for scientific study. At ordinary temperatures the first four members are gases, the next twelve liquids and the remainder low-melting solids. Boiling points gradually increase with increase in length of carbon chain. As they are completely saturated, most reagents do not attack them and from this property they derived their name, paraffin, meaning "little affinity." Chlorine and bromine readily substitute the hydrogens, especially in sunlight, giving halogenated products. Fuming  $H_2SO_4$  and  $HNO_3$  will attack them at elevated temperatures. Saturated hydrocarbons constitute a large percentage of gasoline, kerosene and other petroleum distillates.

J. E. C.

**PARAGOULD**, a city and the county seat of Greene Co. in northeastern Arkansas, situated 107½ mi. northwest of Memphis. Bus lines, air transportation and two railroads serve the city. Cotton, corn and fruit are the principal crops of the region. The chief manufactures include barrel staves, hoops and other lumber products. On Feb. 17, 1930 a meteorite fell near Paragould weighing 820 lbs. This is one of the largest meteorites known and is now in the Field Museum in Chicago. Pop. 1920, 6,306; 1930, 5,966.

**PARAGUAY**, an inland republic of South America, lying between 21° and 27° 30' S. lat. and 50° 30' and 62° 30' W. long., and surrounded by Argentina, Bolivia and Brazil. The area is estimated to be from

122,000 to 172,000 sq. mi.; the northwest boundary is undetermined. The country is bisected by the Paraguay River which has its source in Brazil and flows southward to its confluence with the Paraná at the extreme southwest tip of the republic. Two distinct zones are thus created: that to the west popularly called the Gran Chaco, is for the most part a grassy plain almost devoid of trees; that to the east is a thickly forested area crossed by ranges of hills. The rivers Paraguay and Paraná are navigable from the South Atlantic by vessels of light draft up to Asunción, the capital, 800 mi. from the coast.

**Inhabitants.** Paraguay has the fewest inhabitants of any South American republic. Most of the population are mestizos, i.e., descendants of the mixture of Guarani Indians and early Spaniards. About 92% of the total population consists of mestizos and Indians. The Indian population, chiefly semi-nomadic, is of a low order of civilization. The most important element in Paraguay consists of Europeans: Spanish, Italian, French, British and German. In northern parts of the country there are settlements of Mennonites who have formed agricultural colonies. The census of 1927 gave the population as 791,460 exclusive of the disputed Chaco region, which had 7,500 whites and 30,000 Indians. In 1929 the estimated population was 843,905.

**Climate.** The country is essentially subtropical and has a considerable range of temperature. In the summer months the temperature may rise to 108° F. and in winter may drop to 33° F. In general three months, Dec., Jan. and Feb. are very hot, one and one-half months disagreeably cool and the remainder pleasant. The annual precipitation increases from about 30 in. in the west to 60 in. or more in the hilly east. The lands to the west have a dry period in June, July and Aug., when streams become mere ribbons and grasses wither.

**Forest Industry.** About 60% of the total area of Paraguay is forested and large numbers are engaged in the production of forest products. The *quebracho* forests, now the most important source of tannin extract in the world, contain a variety of trees, but the *quebracho colorado* (*Schinopsis Lorentzii*) yields most of the tannin extract. It possesses a far higher tannin content than most woods of North America, twice as much as hemlock. A source of considerable wealth in the forests is *petit-grain*, a base for perfumes and flavoring extracts, distilled by the natives from the leaves of the wild bitter-orange tree. The yerba maté, or Paraguay tea, industry engages the attention of some 50,000 people in the forest zone. In addition to a large native consumption this product amounts to about 10% of the total value of the exports. The harvest season lasts, in general, about six months; at that time the pruners enter the plantations and the forest, cut the branches bearing tender green leaves, roast and dry the leaves over fire and pack them for shipment.

**Flora and Fauna.** Eastern Paraguay has primeval subtropical and even tropical woodlands, with magnifi-



cent trees of great economic value. With improved transportation great prosperity for the forest regions is indicated. Many varieties of hardwoods, of which *cedro*, or Spanish cedar, is the most important, meet the heavy demand in Buenos Aires. The most valuable plant in this region is yerba maté, which is here indigenous, although it ranges also beyond the Paraná into the neighboring provinces of Brazil. Western Paraguay has mostly swampy moorlands, diversified with dense *quebracho* forests (*Loxopterygium Lorenzii*) and palms.

**Agriculture.** Tobacco is the leading commercial crop. Grown principally in an especially favorable region of red sandy soils and excellent climate in the north and east of Asuncion, tobacco comprises an unusually distinctive part of Paraguayan life. Ranking next to corn in acreage, the tobacco plant occupies more land than the combined total for all other crops, exclusive of cotton. Although known since colonial days cotton was of scarcely any importance as late as 1916, when the crop occupied 120 acres. In 1931 it constituted a significant export commodity of Paraguay. From 1916 to 1925 the cotton acreage increased three hundredfold.

Paraguay devotes about 35% of the entire area of the country to the raising of cattle, horses, sheep and hogs. The native cattle, descended from Spanish stock introduced long ago, have degenerated. Some of the Indian zebu type from Brazil have been brought in; but although they resist disease better than other cattle, they make poor beef. The more progressive cattle companies have introduced foreign pure-bred cattle, especially Herefords, and have improved the stock on their *estancias*. One of the largest of these companies owns a tract of 1,250,000 acres and keeps 150,000 cattle.

**Commerce.** To utilize better its resources of forest, farm and savanna, Paraguay faces the problem of making marked improvement in its highway and railroad systems. The foreign trade of Paraguay is small, the smallest of any of the South American republics. The country lacks coal and oil. Comparatively large water power resources lie untouched. Wood, the chief factory fuel, despite its abundance, is procured at considerable expense. Unskilled and shiftless labor hinders factory operations. The chief factory units of the country include quebracho plants, meat-packing and extract establishments, sugar refineries and brick kilns. Manufactured goods constitute most of the imports.

### HISTORY

While pilot-major of Spain in 1527 and 1528 SEBASTIAN CABOT explored the Paraná and Paraguay rivers. Diego García in a private trading venture extended the area of exploration in 1529-30. Juan de Ayolas in 1536 led a party of 300 Spanish adventurers into Paraguay where in the following year one of his lieutenants, Domingo Martínez de Trala founded Asuncion. Franciscan missionaries entered the region as early as 1542; in the last decade of the century the

Jesuits laid the foundations of a religious and civil domination which lasted until the expulsion of the Jesuit order in 1769. The region was made a dependency of the new viceroyalty of Rio de la Plata in 1776, but after the deposition of the Spanish viceroy in 1810 it manifested an intention to become independent of Buenos Aires. An Argentine army was decisively defeated by the Paraguayans in Mar. 1811, and under the leadership of José Gaspar Rodríguez de Francia an independent government was established. Nominal allegiance to the Spanish Bourbon king, however, was not repudiated until Oct. 12, 1813. At first sharing executive and military authority with Fulgencio Yegros, an influential gaucho member of the revolutionary junta, Francia in Oct. 1814, obtained dictatorial powers which he exercised until his death in Sept. 1840. His objectives were maintenance of the political isolation of Paraguay and the avoidance of factional disorders. The inhabitants were forced to become economically self-sufficient. Diversified agriculture over an increased acreage, the development of ranching, stimulation of the textile industry, and the practice of bartering at regional fairs in lieu of a freely circulating currency, were features of the domestic economy which he encouraged. The frontiers were strongly fortified, and an exchange of tropical woods for munitions from Argentina was almost the sole foreign commerce. Francia repudiated papal authority over the Church in Paraguay, and used the Church as a means of retaining control over the population, which was composed largely of illiterate aborigines.

For four years after his death a bi-consular system was again maintained; one of the executives, CARLOS ANTONIO LÓPEZ, a *mestizo*, secured exclusive executive authority in 1844 and remained in control until his death in Sept. 1862. He encouraged immigration, distributed public lands among homesteaders, and, among measures for the development of commerce, opened the rivers and harbors to both Paraguayan and foreign ships, introduced the telegraph, and built cart roads. The first railroad in Paraguay, between Paraguari and Asuncion, was completed in 1861. Commerce in timber, hides, and mate was administered as a state monopoly. The possibility of an Argentinian invasion as long as Rosas was dictator at Buenos Aires, and a protracted boundary dispute with Brazil, were factors in the adoption of a policy of military preparedness. López in 1855 placed his son, FRANCISCO SOLANO LÓPEZ, in command of the army. As the latter with his troops was in the capital city when an extraordinary congress met, in Oct. 1862, to elect a president; he was, under the circumstances, the successful candidate. Pursuing an imperialistic course, Francisco López intervened in a dispute between Brazil and Uruguay, and shortly involved Paraguay in war with both Brazil and Argentina. The war ended in Mar. 1870, with the death in battle of the Paraguayan dictator. Military casualties, famine and disease had reduced the population of the country by half within five years. Paraguay ceded lands south of the Paraná and the Pilcomayo rivers to Argentina, and a northerly area

to Brazil. A boundary dispute with Bolivia still remained unsettled in 1932 and thus continued to be one of the danger spots in South American politics.

A convention which met at Asuncion in Aug. 1870 framed a modern constitution designed to prevent future dictatorships. However, politics were characterized by frequent revolutions and assassinations until in 1912 a trend toward stability set in with the election of Edward Schaerer, of German extraction, to the presidency. During the executive tenure of Eusebio Ayala, 1924-28, payments of interest on the foreign debt, greatly in arrears, were resumed; the currency was stabilized; and a tariff system outlined by an American expert was adopted.

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**PARAGUAY**, a river of South America which rises in the Brazilian province of Matto Grosso, about  $14^{\circ} 24'$  S. lat. It flows southwest as far as Villa Maria, along the foot of the high plateau which divides it from the Cuyaba River to the east; and then turning southward soon reaches the morass Lake of Xarayes, which it traverses for about 100 mi. until its junction with the São Lourenço. A few miles below Villa Maria it receives the Jauru, an affluent from the northwest, which has its source nearly in contact with the headwaters of the Guapore branch of the River Madeira. The first river of importance entering the Paraguay from the east, below the Cuyaba, is the Taquary. It is a river famous in the history of the slave-raiders from São Paulo in the 16th century. About 50 mi. south of this stream the Mondego also flows into the Paraguay; and still further south is its very straight tributary, the Apa, which is the boundary line between Paraguay and Matto Grosso. From northern to southern Paraguay the western drainage slope of the country has numerous short streams which swell the parent river.

The length of the river from its source to where it leaves Brazilian territory at the confluence of the Apa is 880 mi. It runs another 420 mi. through Paraguayan territory to its confluence with the Paraná. Below that point the river is known as the Paraná.

The mean width of the Paraguay in Brazilian territory is over 1,000 ft. and its mean minimum depth is 10 ft., making it navigable at all seasons for steamers of that draft from Argentina and Paraguay as far up as Corumbá. It is subject to periodic rises which raise the level of the river to twice its normal depth and overflow its banks for hundreds of miles.

**PARAGUAYAN WAR (1865-70).** See **LATIN AMERICA**.

**PARAGUAY TEA**, an English name applied to the valuable beverage plant known in Latin American countries as **MATE**.

**PARAHYBA**, a city of Brazil and capital of the state of the same name, situated about 10 mi. from the mouth of the Parahyba River, and about 75 mi. north of Pernambuco. The mouth of the river, where the

village port, Cabedello, is located, is silted, so that only light vessels can enter. A street car line connects the city with its port. Parahyba is well-built, and has a high school, a normal school, a school for marines and a gymnasium. It was founded in the latter part of the 16th century. Est. pop. 1930, 74,104.

**PARALDEHYDE**, a colorless liquid with a sweetish odor, prepared by polymerizing **ACETALDEHYDE** with sulphuric acid. It boils at  $124^{\circ}$  C., melts at  $10.5^{\circ}$  C. It is soluble in water and is miscible in all proportions with alcohol. It is a source of pure **ALDEHYDE**. It acts as a prompt and fairly active hypnotic and sedative, producing sleep which greatly resembles natural sleep; large doses have been employed in delirium tremens. See also **NARCOTICS**; **CARBAMIDES**.

**PARALLAX**, in astronomy, the difference between the direction of a celestial object as seen by the observer, and as seen from some standard point of reference. It has become almost synonymous with distance. The parallax of the sun, or of the moon, is taken as the difference in the direction from the observer's position on the surface of the earth and from the center of the earth. This difference is also equal to the angle under which the radius of the earth is seen from the sun or moon.

The parallax of a star is understood to be the difference between the direction in which the star is seen by an observer on the earth and that in which it would be seen from the sun. In this case the parallax is equal to the angle under which the radius of the earth's orbit around the sun would be seen from the star. This radius of the earth's orbit thus constitutes a base line for the measurement of stellar distances. In both instances the parallax is inversely proportional to the distance from the earth to the object.

The parallax of the sun and the moon may be directly measured by making observations from two places reasonably far apart on the earth, but may be more accurately deduced by indirect methods. Similarly, for a star, the parallax may be obtained from observations made at two points in the earth's orbit which are as far apart as possible, that is with an interval of six months.

By photographic methods the parallaxes, and hence also the distances may be determined for all stars nearer than, say, 300 light years. But for stars still farther away the errors of observation become relatively so large that they mask the parallax, and recourse must be had to indirect methods. A first extension of the baseline employed may be effected by using, instead of the motion of the earth around the sun, that of the sun in space. This lengthens the baseline from the diameter of the earth's orbit, 186 million miles, to a line which increases nearly 400 million miles annually, and which may be allowed to accumulate to almost any length desired. The drawback of this method is that the effect observed in the stars is not a pure reflex of the sun's motion in space, but contains also the star's own motion in it. Hence the method can be applied statistically only to a group of stars but not to individual objects.

Among the other indirect methods in use and which can be applied to individual objects may be mentioned the spectroscopic method. From a minute analysis of the strength of certain lines in the spectrum, the real luminosity of a star may be estimated. By combining this with the apparent brightness the distance is immediately indicated. This method gives very accurate parallaxes, and can be applied to any star, however distant, which is bright enough to have its spectrum photographed. Its usefulness, however, is limited largely to yellow and red stars.

Other classes of stars, such as Cepheid variables, likewise afford a way of estimating their intrinsic luminosity and hence their distance. This method can be extended to stars too faint to give distinct spectra. For binary stars in which the period of revolution and the separation is known, the distance can be estimated by making certain assumptions about their mass. Parallaxes of stars belonging to MOVING CLUSTERS can be accurately determined by a consideration of the apparent motions in the sky of all the members of the group. When the parallax of a star is one second of arc, the distance from the earth to the star is 206,265 times that from the earth to the sun, or 19,000,000,000,000 miles. This has been chosen as the unit of distance in the universe and is called the parsec, from *parallax* and *second*.

W. J. L.

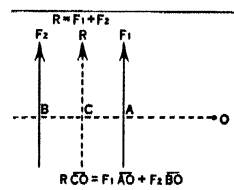
**PARALLEL FIFTHS**, in music, known also as consecutive fifths, are successive intervals of the fifth between voices moving in parallel motion, ascending or descending simultaneously. Like parallel octaves, they are prohibited in both HARMONY and COUNTERPOINT, although an exception is made in the case of a perfect fifth followed by a diminished fifth. The reason for their proscription is somewhat obscure, since one of the chief arguments urged against them, the loss of the independence of the voices, also militates against parallel thirds and sixths. Indeed, parallel fifths and octaves were used continuously and exclusively in the earliest form of counterpoint, namely, in *organum* during the early Middle Ages. However, subsequent refinements of taste led musicians to censure such progressions which, while not invariably offensive, are deemed generally undesirable. A general ban was therefore placed upon them. Even concealed parallel fifths and octaves are looked upon with disfavor in strict counterpoint, such concealed intervals being produced by the parallel motion of voices which ideally, i.e., silently, pass through the prohibited interval, as in the following example:



**PARALLEL FLOW.** When heat or material is to be transferred from one fluid stream to another, the streams flow either in the same direction or in the opposite direction. The first case is called parallel flow, and the second is called counter-current flow. The latter is by far the more general, but parallel flow is sometimes used. For example, suppose it is desired

to cool a stream of water from, say, 200° to 80° F., by parallel flow. If the cooling water is at 70° F., it cannot be possibly heated to a temperature higher than 80° F., and much water will be used under parallel flow conditions. See also COUNTER-CURRENT FLOW.

**PARALLEL FORCES**, two forces in the same plane whose point of intersection recedes to an infinite distance. The resultant of two such forces acts in a direction parallel to them and is equal to their algebraic sum. Thus, in the figure, if the forces are  $F_1$  and  $F_2$ , the magnitude of the resultant is  $F_1 + F_2$  when they are in the same direction and  $F_1 - F_2$  when they are in opposite directions. The position of the resultant is such that its moment about any axis is equal to the sum of the moments of the two forces about the same axis. By applying this law the position of the resultant can be determined. From the figure:  $F_1 AO + F_2 BO = R CO$ .



PARALLEL FORCES

**PARALLELISM**, or what is more commonly known as the theory of psychophysical parallelism, is one of the historical explanations of the relation between mind and body. The theory holds that mental and physical states represent two independent series running parallel to each other. When there is a change in the physical series there is a parallel change registered in the psychical. The theory has been widely held by both psychologists and philosophers. It is closely akin to the double aspect theory, but is, however, much more dualistic.

**PARALYSIS**, loss of the power of movement of a part of the body. The term, however, may also be applied to loss of the secretion from a gland or to loss of mental function. Paralysis of a muscle or group of muscles is due to injury to the nerve supply.

Voluntary motor impulses, or impulses that produce movement of muscles, start in the cortex of the brain. The nerves are made up of parts called neurons. The motor impulses pass through at least two neurons, called upper and lower motor neurons. The upper motor neurons, coming from the brain, cross from one side to the other.

Injuries to the brain and upper part of the spinal cord, that is, injuries affecting the upper motor neurons, cause a different type of paralysis from that produced by injuries to the lower part of the spinal cord and the nerve tracts coming from the cord. In the latter instances, the lower motor neurons are affected.

Injuries to upper motor neurons produce *spastic paralysis*. In this type, the muscles are contracted and rigid. There is only moderate wasting. The deep reflexes are increased in intensity. Injuries to lower motor neurons produce *flaccid paralysis*. In this type, the muscles are relaxed. Wasting of the muscles is marked and occurs rapidly following the paralysis. The reflexes are completely lost.

Normal muscles may be stimulated by both induced and galvanic electrical currents. When paralysis is due to injury to a lower motor neuron, the muscles will not respond at all to the induced current but is stimulated by a galvanic current. In addition, there are certain qualitative changes in the reaction of the muscle to the galvanic current. The qualitative and quantitative change in reaction to galvanic current and failure to respond to the induced electrical current make up what is known as the *reaction of degeneration*. This reaction is not present in paralysis due to upper motor neuron injuries.

By determining the type of paralysis present, some information is gained as to the location of the injury.

It is obvious that there are many types of disorders and injuries that may produce loss of movement in muscles. The injury may be in the nature of an infection or intoxication. Dementia paralytica, due to syphilis of the nervous system, is the most common of the infectious disorders producing paralysis. In this disorder the paralysis develops slowly and may be only partial.

Inflammation and degeneration of nerves with paralysis may occur from poisoning with alcohol, lead, arsenic and mercury, and rarely from other metals. The toxin produced by the diphtheria germ also can cause the same disturbance. It may be present in diabetes. The extensor muscles below the elbow and knee are the ones most often involved. The paralysis is of the flaccid type.

Even with extensive paralysis of this type recovery may occur if the cause can be removed. Improvement may be slow at the beginning.

Injuries such as fractures that cause pressure on nerves or on the spinal cord produce paralysis. Hemorrhage into the brain or APOPLEXY will cause paralysis on the side of the body, opposite to that part of the brain affected by the bleeding. This is due to the fact that the upper motor neurons cross from one side to the other. In HEMIPLEGIA, paralysis may be complete or partial. It may involve the whole side of the body or affect only the leg, arm and face. Some degree of recovery usually results. (See also APHASIA.)

Injury to the brain of the newborn produces a widespread spastic paralysis. (See CHILDREN, DISEASES OF: Injuries Attending Birth.)

Another infectious disorder often responsible for paralysis is anterior poliomyelitis or INFANTILE PARALYSIS. In this disease loss of function comes on suddenly and the paralysis is of the flaccid type.

The cause for the paralysis sometimes is unknown. Thus, there is a disorder known as *Landry's paralysis*. The origin of the disease has not been discovered. The paralysis is of the flaccid type, and the reflexes are lost. However, there is little wasting of the muscles, and the reaction of degeneration is not present as in other types of flaccid paralysis. This disorder is often fatal because of paralysis of the diaphragm and loss of breathing power.

Other diseases in which paralysis occurs are multi-

ple sclerosis, paralysis agitans or Parkinson's disease; encephalitis or inflammation of the brain; progressive bulbar paralysis; syringomyelia, and a number of other rare disorders affecting the nervous system. Tumors of the brain and cord produce paralysis through pressure on the nerve tissue.

W. I. F.

**PARAMAGNETISM.** See MAGNETIC INDUCTION.

**PARAMARIBO**, the capital and the only city of importance in Dutch Guiana, situated at the mouth of the Surinam River. Despite the tropical atmosphere, Paramaribo is essentially a Dutch town. The governor's residence, the synagogues and churches, the lofty town hall, the military hospital, fort and barracks are all Dutch in appearance and character. The city has been twice devastated by fire and once ravaged by yellow fever. It is a regular port of call for many ocean-going steamers and there is a lively coastwise trade. There is little manufacturing, agriculture having always predominated; consequently, except for minor quantities of shoes, matches, baked goods and tobacco, all manufactures are imported. Pop. 1929, 46,953.

**PARAMECIUM**, the name of a genus of Infusorians, whose members are graphically described as slipper animalcules. They are very common in ditches, pools and infusions. For a one-celled animal the paramecium is large, being about  $1/125$  in. long. Its body is covered with tiny cilia with which it rows itself through the water. There is an oval groove on one side of the body and certain cilia along this groove are also used to fan bacteria, which it eats, toward the mouth. Gastric vacuoles form at the bottom of the gullet, and when they are full of bacteria and water they move through the cell until their contents are digested. There are two nuclei, a macronucleus and a micronucleus, and there are two contractile vacuoles for the elimination of waste materials.

Paramecium ordinarily reproduces by simple division, but after a number of generations two individuals come together in conjugation, and exchange material from their micronuclei. Conjugation, like cross-fertilization, seems to have the effect of maintaining the vigor of the race.

**PARANÁ**, a city of Argentina, situated on the Paraná River, about 400 mi. northwest of Buenos Aires. The custom houses and wharf are at the river-side port, Bajada Grande, about 3 mi. distant, and a modern ferry connects it with SANTA FÉ. It has an elevation of 125 ft. above the river, and a mean temperature of  $65^{\circ}$ . It was founded in 1730 by colonists from Santa Fé and was the capital of the republic for 10 years prior to 1861. Est. pop. 1930, 64,994.

**PARANÁ**, a river of South America, rising as the Rio Grande about 100 mi. northwest of Rio de Janeiro, and flowing a few miles to unite with the Paranaíba to form the Paraná; it is called Mother of the Sea by the Indians. The Paraná drains a vast area in southern Brazil and is about 1,600 mi. long from its extreme source to its junction with the Paraguay; from the junction it is 600 mi. more to the La Plata estuary, with a width of from 1 to 3 mi.

The river proper flows only a short distance before it is broken by the Urubu Punga Falls, which constitute a barrier to navigation from below. But after passing those falls the river widens out to nearly  $1\frac{1}{2}$  mi. and is then navigable for 325 mi. to the great Guahyra Falls, at the point where the Paraná becomes the boundary with Paraguay. Here the river narrows to about 230 ft. between the elevations of the Maracaju Range, and drops in seven distinct falls, of which the chief one has a drop of 55 ft., with a total horsepower estimated at from 4,000,000 to 20,000,000, one of the greatest sources of hydroelectric power in the world. From here the Paraná flows westward to meet the Paraguay near the southern border of the Paraguay republic. It then rolls through Argentina till it unites with the Uruguay, near Buenos Aires, to enter the La Plata estuary. The frontage of the Paraná delta is 40 mi. across, almost in a straight line from north to south. Through this the river finds its way to the estuary by 11 large and small outlets.

In the middle Paraná from the mouth of the Iguazu to the mouth of the Paraguay there are many islands, some of them large, rocky and high above the river. Islands, several of great area, are numerous from the mouth of the Paraguay to the city of Rosario, and below the point they soon increase in number and size until the Plata is reached. They are mostly covered with dense vegetation which is dark green mingled with crimson foliage of the *seibo* tree.

**PARANOIA**, an extreme peculiarity of the personality of such a grade as to make the individual clearly abnormal. It is a progressive form of insanity characterized by gradual impairment of the intellect and accompanied by delusions, usually of persecution.

It often assumes well-recognized types. Many so-called religious fanatics suffer from paranoia. The litigious form causes the individual to press unreasonable claims constantly in court. The socialistic type is the most serious, since it occasionally leads to violent acts, such as assassination.

Paranoia commonly begins with suspicion. The individual feels that someone has wronged him, or balked his plans, and is now following him up with a systematic campaign of persecution. Gradually the delusion grows, but his self-importance also expands until a delusion of grandeur accompanies that of persecution.

The disorder is permanent and is entirely uninfluenced by argument or logical explosion of the fallacious ideas. Many paranoiacs are harmless but more pronounced cases must be committed to institutions, either because they are unable to care for themselves or because they are dangerous when at large.

**PARAPET**, any embankment constructed to protect troops or artillery from hostile observation and fire while permitting them to deliver their own fire to better advantage. Parapets are of sufficient thickness to prevent penetration of hostile bullets. They are manned only during attack.

**PARAPSYCHOLOGY**, a word used by some psychologists to refer to the pseudo-sciences, such as

PHYSIOGNOMY and systems of character reading and quack practices based upon them, as well as to occult forces and modes of recognized forms. The last is called specifically **METAPSYCHICS**.

**PARASITE RESISTANCE**, an aeronautical term applied to a component of the air resistance of an **AIRPLANE**. The total air resistance is composed of induced resistance and parasite resistance. The first depends upon the wing arrangement and varies inversely as the square of the speed. The parasite resistance comprises all other items of resistance, and in general varies directly as the square of the speed. The major objects causing parasite resistance are the fuselage, engines, nacelles, tail surfaces, landing gear, struts and wires, and wing profiles. Parasite resistance is conveniently expressed in terms of the area of a flat plate having the same resistance when normal to the wind. The equivalent flat area of the parasite resistance varies from about 5 to 15 square feet for a single engine airplane to about 25 to 50 square feet for a tri-motor plane. The exact value is a measure of the cleanness of the design and determines, to a great extent, **AIRPLANE PERFORMANCE**. See also **AERODYNAMICS**. W. S. D.

**PARASITIC DISEASES**, those caused by certain low forms of animal life. Some are caused by amebae, by bacterial forms of uncertain nature and by larvae. Others are caused by adult forms of larger animal parasites. A number of the parasitic diseases are transmitted from man to man by biting insects. Such transmission is not a simple transference of the parasites, but each parasite must necessarily pass through a certain stage of its life within some variety of particular insect. The parasites of **MALARIA** are an example of this type. (See also **TROPICAL DISEASES**.)

Certain types of organisms known as *flagellates* may cause disease of the bowels with diarrhea, colic and the passage of blood and mucus from the bowels. Other parasites, such as the *Trichomonas hominis* and *Lamblia intestinalis* cause similar disorders.

*Flukes* are parasites with flattened or leaf-shaped bodies. The flukes may enter the lungs or bronchial tubes, causing cough, the bringing up of rusty brown sputum and sometimes bleeding from the lungs. The disorder occurs most extensively in China, Japan and the Philippines. There are also several species of flukes that get into the liver in man. They cause enlargement and hardening of the liver with diarrhea and blood in the stools. This disorder is rarely found in America. The flukes may enter the blood and are then carried to the various tissues, particularly to the veins of the bladder and rectum. Irritability of the bladder and blood in the urine are the most common symptoms.

Larger worms, as the *tapeworms*, also enter the intestinal tract, and grow there indefinitely. There are various types, such as the pork, beef and fish tapeworms. The parasites may cause no disturbance and are rarely dangerous. There may, however, be abdominal pain, nausea, diarrhea and sometimes ane-

mia. The larvae or immature forms of the tape-worms may get into the tissues and cause more severe trouble. Echinococcus or hydatid disease is of this type, in which cysts are formed in the various organs.

Other parasites found in the intestines are round worms and pin-worms. *Round worms* also may cause no symptoms, or may produce slight abdominal pain. *Pin-worms* occupy the rectum and the large bowel or colon. They may cause irritability and restlessness, disturbed appetite and anemia. The worms can readily be seen in the bowel movements.

In TRICHINOSIS, the embryos of the parasite get into the muscles, causing inflammation and pain in the muscles. Trichinosis is contracted by eating uncooked, infested pork. The disorder is occasionally fatal, and in some outbreaks mortality may be as high as 30 per cent.

HOOKWORM DISEASE, in which the parasites are found, for the most part, in the jejunum, causes pallor, underdevelopment and poor nutrition. There is also apathy and lack of energy.

Various skin disorders are produced by parasites. The most common of these are *ringworm* and *scabies*, commonly called the itch. There are parasitic insects, such as lice, that live on the skin of the body. See PEDICULOSIS.

W. I. F.

**PARASITIC PLANTS**, a group of very miscellaneous plants that in part, or wholly, get their food from other plants to which they are always attached. It is no mere mechanical attachment, as in epiphytes, but a physical union whereby the parasite draws necessary food materials from the host plant. And the host plant is always living, so that parasitic plants differ from SAPROPHYTES, which live on the dead remains of other plants.

While parasitism is very common among the fungi, it is comparatively rare among flowering plants. Some plants, like the MISTLETOE, are only partial parasites, in which case they contain chlorophyll and make at least some of their own food. Others, like the dodder, broom-rape and cancer-root are total parasites, and have little or no green coloring matter in their tissue. Total parasites, and many partial ones, have no true roots. They are attached to the host by specialized suckers known as haustoria, through which they absorb the elaborated sap of the host.

The origin of the parasitic habit is obscure. It is often considered as a degeneration from plants that live wholly on their own roots, coming, possibly, to pure parasitism, by way of saprophytism. Competition for food is thought to be one of its causes. This is supported by the fact that parasites are more common in the tropics than elsewhere, one Brazilian family containing over 400 species of parasites. See RAFFLESIA.

N. T.

**PARASITISM**, type of association between two different species of living organisms. In a broad sense it may be applied to any case in which two different species of animals or plants, or a plant and

an animal, live together (*see* COMMENSALISM). In a restricted sense it implies that one member of the association, the parasite, lives at the expense of the other, which is known as the host. Sometimes one species of parasite may parasitize another parasite; this type of association is known as hyperparasitism.

Parasites that live within the body of another species of organism are called endoparasites; those that live on the outside are referred to as ectoparasites. Various types of parasites occur in nature. Thus an organism that is capable of living either free or as a parasite is a facultative parasite; one that depends for its existence on its host, an obligatory parasite. A permanent parasite is one that is parasitic throughout its life cycle; a temporary parasite is free-living during part of its life cycle.

Parasites occur in almost every large group in the animal kingdom. They are especially abundant among the Protozoa, worms and insects. There are only a few parasitic sponges, coelenterates, mollusks and vertebrates. Practically every animal that has been carefully examined has been found to harbor parasites. Human beings are known to be parasitized by about 25 different species of Protozoa, about 100 different species of worms, and 100 different species of arthropods, such as insects or mites.

The parasitic mode of existence is correlated with certain modifications in the structure, functions and life cycle of parasites. These modifications may take the form of either simplification or complication. Changes in the organs of locomotion, nutrition and reproduction are rather general among parasitic organisms. For example, parasites are ordinarily transported from place to place by the host and frequently are transmitted from one host to another without any effort on their part. It is, therefore, not strange that the locomotor organs of parasites should become simplified or should be in some cases absent entirely. Organs of nutrition are also often modified or lost, since the normal condition for parasites is life in an organic medium from which food is absorbed through the surface of the body. The reproductive organs of parasites, on the other hand, are frequently larger and more complicated than those of free-living relatives, and the number of eggs produced by parasites is in general many times as great as that of nearly related free-living species. This must necessarily be so, because the chances of an egg of a parasite producing an offspring which will succeed in establishing itself within another host are very slender.

Parasites are more or less definitely localized on or within the body of the host. There are some species that may live almost anywhere but most of them have a definite habitat just as do free-living organisms. Thus, a species of amoeba lives in the human mouth; other species of amoebae live in the large intestine; a flagellate (*Giardia*) lives in the duodenum of man; another flagellate (*Trichomonas*) lives in the vagina of women; the malarial organism lives within red blood-corpuscles; and the typanosomes responsible for African sleeping sickness live in the blood plasma.

Most of the organisms that are called parasites in the broad sense do not injure their hosts. Some of them injure their hosts to a slight extent only and the host is able to repair the damage as rapidly as it is done. A sort of equilibrium is thus established. A few parasites are pathogenic and often lethal. For example, human beings may be injured or killed by the animal parasites that are responsible for amoebic dysentery, malaria, African sleeping sickness, kala azar, hookworm disease, round worm infection, trichinosis, tapeworm disease or myiasis. Fortunately drugs have been developed that are effective against most of the injurious species of human parasites.

Domesticated and wild animals are also injured and sometimes killed by animal parasites, such as the protozoans that cause Texas fever in cattle and coccidiosis in fowls, the worms that cause staggers in sheep and gapes in poultry, and the insects and ticks that transmit disease germs from one host to another.

R. H.

**PARATHYROID GLANDS**, small ductless glands lying embedded in or near the THYROID GLAND, but no part of it. In man and in most other mammals there are four of these organs. Two lie on each side of the trachea. Each is composed of a mass of epithelial cells, among which is a network of capillaries.

Two kinds of symptoms follow the removal of parathyroids. In the majority of cases convulsions (tetania parathyroprova) develop within forty-eight hours after the operation, and these usually terminate fatally. In the remainder of cases, after some weeks changes are apparent in the hard tissues of the body (bones and teeth). This second group of symptoms is clearly related to the calcium content of the body, and is adequately explained by the decrease of this mineral in the blood serum which is observed after the operation.

Opinions vary as to the cause of the tetany. One group of investigators believes that the parathyroids have the ability to destroy or neutralize poisons which arise in the body as by-products of muscular activity or digestion. According to this view, tetany is the result of accumulations of these poisons in the absence of the parathyroids. Another group holds the view that the tetany, like the later symptoms, is due to the deficiency of calcium in the blood.

That tetany is actually due to the loss of the parathyroids is shown by the fact that it may be prevented by the administration of an extract of the gland.

M. M. H.

**PARATYPHOID FEVER**, an acute infection closely resembling a light TYPHOID FEVER. In fact, it is impossible to distinguish between the two diseases at the bedside. If, however, the bacteria causing the condition be grown in the laboratory, they are seen to differ from the bacillus of typhoid in certain reactions. There are two types of the paratyphoid organism which have been termed *Bacillus paratyphosus*  $\alpha$  and  $\beta$ . An attack of the disease produced by one of these three related organisms does not

confer immunity against the others. Accordingly, in preparing typhoid vaccine, the three bacteria are mixed together.

Since paratyphoid is so similar clinically to typhoid, a description of the latter condition (*see* TYPHOID FEVER) will suffice for the disease under discussion. Complications are less frequent than in typhoid.

**PARCAE**, in Roman mythology, the three goddesses of fate known as the Moerae or FATES.

**PARCEL POST**, in the United States the package carrier operated by the Federal Government. Although many European and South American countries had parcel post systems in operation for a number of years, the system was not adopted by the United States Post Office until passage of the Parcel Post Act in 1912. Up to that time packages not exceeding 4 lbs. were accepted for delivery as 4th class matter, and in 1912 represented approximately 5% of the total weight of the mails. For the fiscal year ending June 30, 1930, the 4,241,169,697 lbs. of parcel post represented 60.85% of the weight of the mails, totalled 837,308,320 pieces, and returning a gross revenue of \$151,658,537.13, a figure in excess of the gross combined revenue of all express companies in the United States. The steady increase in parcel post receipts has been made possible by improvements every year in the service, and successive rate reductions allowed by the INTERSTATE COMMERCE COMMISSION. The Act of 1912 created eight zones, divided into distances from 50 miles, representing the first zone, to distances of over 1,800 miles, the eighth zone. The maximum weight was set at 11 lbs., increased in 1913 to 20 lbs., in 1914 to 50 lbs. for the local, first, and second zones, and on Aug. 7, 1931 to 70 lbs. for all zones. In the latter year the maximum size of parcel post packages was increased from 84 to 100 ins. in length and girth combined. Parcel post rates as of Aug. 7, 1931 were as follows:

Local Delivery . . . . .	First lb., 7¢—1¢ ea. additional 2 lbs.
First Zone up to 50 miles . . . . .	First lb. 7¢—1¢ ea. additional lb.
Second Zone up to 150 miles First lb. . . . .	7¢—1¢ ea. additional lb.
Third Zone 150 to 300 miles First lb. . . . .	8¢—2¢ ea. additional lb.
Fourth Zone 300 to 600 miles . . . . .	First lb. 8¢—4¢ ea. additional lb.
Fifth Zone 600 to 1,000 miles . . . . .	First lb. 9¢—6¢ ea. additional lb.
Sixth Zone 1,000 to 1,400 miles . . . . .	First lb., 10¢—8¢ ea. additional lb.
Seventh Zone 1,400 to 1,800 miles . . . . .	First lb., 12¢—10¢ ea. additional lb.
Eighth Zone over 1,800 miles First lb., . . . . .	13¢—12¢ ea. additional lb.

Expedition delivery is given to parcels marked Special Delivery, ranging in cost from 15 cents for 2 lbs. to 35 cents for packages over 10 lbs. exclusive of postage. Expedition handling is given to parcels sent Special Handling, ranging in cost from 10 cents for 2 lbs., to 20 cents for pieces over 10 lbs. Packages may also be sent insured and shipped C.O.D. (*see* CASH ON DELIVERY), with a maximum delivery collection of \$200. The domestic service linked with the parcel post systems of foreign nations, thus permitting a package to be sent to almost any part of the



world by governmental agency. Due to the growing importance of the service the Postmaster General in 1931 created the office of Director of Parcel Post, with headquarters at Washington, D.C.

**PARDEE DAM**, located on the Mokelumne River, Cal., is of the massive concrete, arch-gravity, non-overflow type and creates a storage reservoir of more than ten billion cubic feet capacity for the water supply of nine cities on the eastern shores of San Francisco Bay. The maximum height above foundations is 357 feet and above the bed of the stream 350 feet. The greatest base width is 245 feet and the top length is 1300 feet. The volume of the dam is 615,000 cubic yards. The spillway is a separate structure at some distance from the dam. F. K.

**PARDON**, an act of grace (i.e. not demandable of right) exempting the person pardoned from the penalty prescribed by law for an offense he has committed. It may come before prosecution or conviction, but usually comes after conviction. At common law it is a prerogative of the King. In the United States it is in the power of the chief executives—the President of the United States as to federal crimes, the governor as to offenses against State laws. A pardon after conviction restores to all rights.

**PARÉ, AMBROISE** (1510-1590), the father of modern surgery, came to Paris as a barber's apprentice in 1529, and became army surgeon in 1537. His greatest contribution to surgery was the treatment of gunshot wounds. He discarded the use of boiling oil and treated them mildly with an ointment. He invented many surgical instruments; developed artificial limbs and eyes. He described monoxide poisoning, and noted the possibility that flies might transmit disease. He wrote a book on gunshot wounds, an essay on obstetrical procedures, a book on surgery and a treatise on monsters, also a small book on medical jurisprudence. He reintroduced the ligature as a means of tying blood vessels during amputations.

**PAREGORIC**, common name for camphorated tincture of opium. See **OPIUM**.

**PAIREIRA** (*Chondodendron tomentosum*), a medicinal plant of the moonseed family more correctly called *pauera brava*. It is a tall woody climber, native to Brazil and Peru, valued for its root, extensively used as a diuretic.

**PARENTAL EDUCATION**. A movement which arose out of the development of child study in the last decade of the 19th century to enlist the intelligent cooperation of parents in a better understanding of their children and of the progress of education. The growth of the movement has been most rapid in the last 10 years not only in the United States but in most of the leading countries of the world. The scope of parental education is wide and includes not only training in problems affecting children, relations between school and home, and cooperation with schools and teachers, but in improvement of home conditions. In America the work is fostered by a number of governmental bureaus and departments, by city and state departments, by local and state organizations, by a

number of universities and women's clubs, and by such national organizations as the American Association of University Women, the American Home Economics Association, the National Congress of Parents and Teachers, and the Child Study Association. World-wide interest in the subject is focussed in the International Federation of Home and School, formed in 1927. See **PARENT TEACHER ASSOCIATION**.

**BIBLIOGRAPHY**.—J. E. Butterworth, *The Parent-Teachers Association and its Work*, 1928; United States Office of Education, *Biennial Survey of Education, 1926-28*, Ch. XIV, 1930; National Society for the Study of Education, *Twenty-Eighth Yearbook*, 1929.

**PARENT TEACHER ASSOCIATION**, an organization established to coordinate the work of the home and school in the education of children. The parent teacher movement may be said to have started when a small group of women organized the National Congress of Mothers in 1897, with the stated purpose of the education of parents in child development, co-operation of home and school, promotion of the kindergarten movement, and securing of legislation for neglected and dependent children. In 1924 this organization changed its name to National Congress of Parents and Teachers. Parent teacher associations have been organized throughout the country, and in 1930 over 1,000,000 men and women were members of the National Congress. Meetings of parents and teachers are held at regular intervals in the schools during the school term for the discussion of problems pertaining to the children's education and development and to foster a better understanding between parents and teachers. Through these meetings the parents are given an insight into the objectives and methods of the school and are thus enabled to cooperate with the teachers in the highest and most efficient development of the children.

See United States Bureau of Education *Bulletin*, No. 10, 1930.

**PARESIS, GENERAL**, or dementia paralytica, a disorder consisting of degeneration of the brain and lining membranes of the brain known as the meninges. It occurs in syphilis, most often in individuals between 25 and 45 years of age. The condition starts gradually. At first there are such symptoms as inattention to business affairs, forgetfulness, mental fatigue, irritability, outbursts of temper, senseless expenditures. Later on, there are delusions of grandeur and mental exaltation, with restlessness and excitement. There is also progressive dementia and paralysis. The speech is slow and slurred, the writing is tremulous. The individual often has a childish smile.

Recently the disorder has been treated by inoculating the individual with the malaria parasites. The malarial infection is terminated after twelve paroxysms by giving quinine. Good results have also been obtained by producing fever through **DIATHERMY**. Various drugs are used to lessen the mental excitement. With the malaria treatment, a complete remission has been obtained in 30% of the cases. The exact mode of action of the malaria treatment is uncertain.

**PARI-MUTUEL**, a mechanical method of betting on horse races which eliminates placing stakes with



a bookmaker. The system was originated in 1872 by a Frenchman named Oller. He designed blocks of numbered tickets, each block corresponding to one of the racing entries. The tickets were sold in a shed at the course. Originally the system was designed to restrict the operations of bookmakers at French tracks. In 1880 the Oller system was mechanized by a New Zealander named Ekberg, who invented a totalizator. This machine recorded bets automatically, and was first used in 1880 at the Canterbury Jockey Club, Christchurch, N. Z. This mechanized improvement on Oller's system was gradually adopted in Australia and India, and spread to Europe, where the machines, now commonly called *pari-mutuels*, reduced the bookmakers' scale of operations. In parts of Europe, as in the United States, the machines are electrically operated.

The pari-mutuel in use in America differs slightly from its equivalent in Europe, where one large machine records all track bets. The American model consists of several small units within the system, permitting separate bets "to win" and "to place." Bets are registered by means of hand levers, operated by the clicker. Betting ceases when the race begins, and while it is in progress the totals of each machine are added to make a grand total, which determines the returns paid to winners. Paris-mutuels are used on the majority of tracks in the United States. The state governments receive five or six per cent of the sums thus invested. In light of the gambling inevitably present at horse races, the pari-mutuel is defended by its supporters on the ground that it largely eliminates surreptitious betting with a bookmaker.

**PARINI, GIUSEPPE** (1729-99), Italian poet, was born near Milan, May 23, 1729. His early *Poems*, 1752, were succeeded by his masterpiece, a social satire in verse entitled *Giorno*, 1763-65, describing a day in the life of a young man of fashion. The *Odi*, 1757-95, a series of 19 odes, established his reputation as the first great poet of modern Italy. Parini modeled himself after POPE ALEXANDER and JAMES THOMSON, and became a master of the satire and the moral epistle. He died at Milan, Aug. 15, 1799.

**PARIS**, in Greek mythology, son of PRIAM and HECUBA, was exposed, as a babe, on Mt. Ida; but he was discovered by shepherds and brought up by them. He married OENONE. HERA, APHRODITE and ATHENA went to Paris on Mt. Ida to ask him to decide which was the fairest. He chose Aphrodite, who promised him the most beautiful woman in the world. Leading him to Sparta, Aphrodite showed him Menelaus's wife, Helen (see HELEN OF TROY) with whom he eloped. This brought about the Trojan War. Paris died from a wound inflicted by Philoctetes with one of Hercules's poisoned arrows. When dying he called upon Oenone to save him, but she refused to go to him. Then in remorse she threw herself on his funeral pyre.

**PARIS, GASTON** (1839-1903), French scholar, whose full name was Bruno Paulin Gaston Paris, was born at Avenay, Marne, Aug. 9, 1839, son of the

author, Paulin Paris. He was educated in Germany, and eventually filled his father's professorial chair at the Collège de France. His chief interest was ancient French verse, a subject on which he wrote *Histoire poetique de Charlemagne*, 1865, *Les Romans de la table ronde*, and *Poèmes et légendes du moyen âge*, 1900. Many collections of early French literature and poetry were edited by Paris, whose greatest desire was to spread the taste for national literature. He died in Paris, Mar. 6, 1903.

**PARIS**, the capital of France and the center of French national life, often regarded as the most beautiful city in the world. It is situated on the Seine, about 150 mi. from the sea and is a port of river navigation. In size Paris ranks fifth among the world's cities, with a population in 1931 of 2,891,020. The population of the metropolitan district including residential and industrial suburbs is about 6,000,000.

**Plan.** The town grew up on both sides of the Seine about the Gauls' ancient settlement of *Lutetia*



COURTESY M. N. OF ART

PARIS AND THE THREE GODDESSES  
From a black-figured amphora of about 550-500 B.C.

*Pariserum*, located on one of the river islands extending in a form roughly circular to successive lines of ramparts and beyond them. As these lines of fortifications have been pulled down for the expansion of the city, broad streets, keeping the old name of *boulevard* or bulwark, have been laid out upon their sites. The busy Grands Boulevards with their extensions on the left or south bank of the river enclose most of the medieval city and follow generally the line of the later medieval ramparts. The fortifications of 1840 were given over to demolition in 1919, and the land thus acquired along encircling boulevards has been set aside for public buildings, parks and dwellings. In each direction the city is crossed by long and relatively straight thoroughfares; of the east to west streets the most important are the rue de Rivoli, Avenue des Champs Élysées, and Avenue de la Grande Armée; the Boulevard de Sébastopol on the right bank and the Boulevard St. Michel on the left are the main sections of the north to south thoroughfares. The river, to which the beauty and commerce of the city owe much, flows between broad

tree-lined quays and is crossed by 32 bridges, the Pont Neuf being the oldest. The Île de la Cité, the oldest part of Paris, is occupied by large public buildings. The Île St. Louis is an old, quiet residential section. On the right bank of the river is the larger part of the city including the chief business, hotel and theater quarter, the newer fashionable residential districts, and a large industrial area. The historic students' and artists' habitat, known as the Latin Quarter, and the aristocratic Faubourg St. Germain are on the left bank, and the Boulevard St. Germain is the principal thoroughfare.

**Parks and Squares.** The parks, parkways, and squares of Paris form one of its great charms. The best known park within the city is probably the Tuileries Gardens, a series of landscaped squares, 75 acres in area, extending from the Louvre to the Place de la Concorde and containing many monuments of which the most noteworthy are the small Arc de Triomphe du Carrousel, 1806, and the heroic monument to "Paris, 1914-1918." The Place de la Concorde, one of the largest and finest public squares in the world, was laid out in its present form in 1854, on the site of the Place then outside the city, where Louis XVI, Marie Antoinette and thousands beside were guillotined; in the center is the Obelisk of Luxor, 1300 B.C., given to Louis Philippe by the Viceroy of Egypt in 1831. To the west the Champs Élysées, first parkway then avenue, sweeps onward to the Place de l'Étoile, where the Tomb of the Unknown Soldier has been set beneath Napoleon's Arc de Triomphe, the world's largest triumphal arch. More than ten avenues radiate from the Place de l'Étoile, one of them, the Avenue Foch, continuing the parkway to the Bois de Boulogne. The Jardin du Luxembourg is a very beautiful park on the left bank of the river. The Jardin des Plantes, also on the left bank, contains scientific museums. Other parks are the delightful Parc Monceau in the fashionable residence quarter near the Étoile, the Parc Montsouris at the city's southern rim, and the Buttes Chaumont to the northeast. The great Bois de Boulogne and the larger Bois de Vincennes are suburbs, though they touch the city's borders. Among the famous squares of Paris are the Place Vendôme, situated in the center of the city, the Place de la République, the Place de la Bastille, the Place des États-Unis which has a monument to American volunteers in French armies killed in the World War; the Champs de Mars, where stands the Eiffel Tower, built in 1888 and until the end of 1930 the tallest structure in the world; the ancient 17th-18th century Places des Vosges; and the Square de Cluny with its remains of Roman baths. There are many other open squares and green spaces, always fresh and well-kept. The arrangement of vistas and back-grounds and the spacing of buildings are among the great attractions of Paris.

**Churches.** The most famous church of Paris is the great Gothic cathedral of Notre Dame, of the 12th and 13th centuries. Sainte-Chapelle, no longer used

as a church, is one of the most perfect gems of Gothic architecture. Among other well-known religious edifices are St. Germain des Prés, with an 11th-century nave and an ancient abbey church; St. Germain l'Auxerrois, of the 15th century; St. Sulpice of the classic style of the 17th-18th centuries; and the modern churches built after ancient models, the Sacré-Coeur located on Montmartre hill, and the Madeleine. The Panthéon, dedicated to Ste. Genevieve, has been since 1791 a shrine of memorial to the great dead of France.

**Museums and Public Buildings.** With Notre Dame, the most celebrated building in Paris is the Louvre, the royal palace of the Renaissance which houses the world famous art museum. The Musée du Luxembourg contains a large and important collection of contemporary art, with a foreign representation in the Musée du Jeu de Paume in the Tuileries Gardens. The beautiful late-Gothic Hôtel de Cluny is a rich museum of historic art objects, tapestries, sculpture, porcelain and jewelry. The Musée Carnavalet once the home of MADAME DE SÉVIGNÉ is the museum of the history of Paris. The Trocadero Palace contains a museum of casts illustrating the history of sculpture and architectural decoration and is also an ethnographical museum. The Rodin Museum in the Hôtel Biron contains a priceless collection of that sculptor's work. The Museum of Decorative Arts is housed in one of the two remaining wings of the old Palais des Tuileries, practically terminal wings of the Louvre. The National Library, National Archives, and Conservatoire des Arts et Métiers also contain important collections, the first-named being second only to that of the British Museum. There are a number of other smaller museums in the city. The great archeological collection is outside at St. Germain-en-Laye. The Hôtel des Invalides, the world's oldest home for soldiers, founded by Louis XIV, has a good military and historical museum. The car in which the Armistice was signed on Nov. 11, 1918, is here, and Napoleon is buried beneath the Invalides Dôme. Among other celebrated public buildings are the Palais de Justice and the Hôtel Dieu on the Île de la Cité, the magnificent Opera House, the Palais Royal of 1670 which now houses the Council of State and the Théâtre Français, the Palais du Luxembourg, rebuilt under Henri IV, where the Senate meets, and the 18th century Palais d'Élysée, the home of the President. Although much Parisian architecture is similar in style the height of buildings being limited, the city gives no effect of monotony, and its scene as a whole is richly varied.

**Education, Art, Industry.** Paris has been a center in art and education for centuries. The École des Beaux-arts is situated on the left bank of the Seine, as are the University of Paris, including the faculties of science and letters, together with some other schools, and known as the Sorbonne and the Collège de France. The Grand Palais with its famous annual Salon, and the Petit Palais are on the Champs Élysées. The decorative arts also find in-

spiration for leadership here and the great Parisian industry of dressmaking makes an art of fashions. Machinery and chemicals are produced in large factories. Since the war industry has taken great strides, portions of the older city have been taken over by commerce, and an impetus has been given to house-building in the suburbs. The traffic problem has become pressing, but the subway system is considered one of the best in the world.

**History.** Known to the Roman conquerors in 53 B.C. as Lutetia, Paris took its present name in the 4th century. It became the capital of the kingdom of France with the accession of the Capetian dynasty in the 10th century, and through the feudal ages the power of the French kings spread out from Paris until as capital it ruled over the whole of what is now France so that its history became that of the nation. Paris was taken by the English during the Hundred Years' War, suffered greatly during the religious wars and the Revolution and has been several times besieged. The city was largely modernized and much of it replanned under Napoleon III. Early in the World War the Germans advanced to within a few miles, but were repulsed at the Battle of the Marne, Sept. 6, 1914; the capital was repeatedly bombarded, from the air and by long range guns, and in 1918 was again threatened.

The cosmopolitan character of Paris has existed since early medieval days and from the beginning of its history Paris has attracted foreign visitors in large numbers.

Of the population about one-tenth are foreigners, and of the native citizens more than a third were born outside the Department of the Seine. The population is predominantly Roman Catholic, there being approximately 100,000 Protestants and about 60,000 Jews.

**PARIS**, a city in eastern Illinois, the county seat of Edgar Co., situated 169 mi. south of Chicago. It is served by bus lines and two railroads. The city is a shipping point for grain and farm crops, and has large railroad shops and factories producing brooms, shoes and other products. Coal is found east of here. The old camping grounds of the Kickapoo Indians, on Twin Lakes, is in the vicinity. Pop. 1920, 7,985; 1930, 8,781.

**PARIS**, a city in northeastern Kentucky, the county seat of Bourbon Co., situated on Stoner Fork of Leckling River, 18 mi. northeast of Lexington. It is served by two railroads. Paris is a metropolis in the blue-grass region, famous for its tobacco and live stock, especially fine horses. The city has canneries and loose leaf tobacco warehouses. Paris was founded in 1784; chartered in 1862. Pop. 1920, 6,310; 1930, 6,204.

**PARIS**, an industrial city in northwestern Tennessee, the county seat of Henry Co., situated 130 mi. northeast of Memphis. Bus lines and two railroads serve the city. Paris is a shipping center for tobacco, cotton, grain, live stock and timber. Its chief manufactures are toilet goods. There are undeveloped gas

and oil fields in this region; and 12 mi. from Paris is a fine artesian sulphur well, drilled in 1823. The Confederates were defeated at the Battle of Paris on Mar. 12, 1862. The city was founded in 1819 and incorporated in 1821. Pop. 1920, 4,730; 1930, 8,164.

**PARIS**, a city and the county seat of Lamar Co., in northeastern Texas, situated about 100 mi. northeast of Dallas. Several railroads, bus lines and an airport serve the city. Cotton is the chief crop of the vicinity. Paris is a medical center for the eastern part of the state. Wood working factories, producing furniture, boxes and other articles, are among the chief industries. In 1929 the value of the factory output was about \$3,500,000; the retail trade amounted to \$9,060,361. Interesting Indian mounds are located nearby on the Red River. The city was settled in 1841, and incorporated in 1874. Pop. 1920, 15,040; 1930, 15,649.

**PARIS, COMMUNE OF**, the municipal government of the French capital. Twice in the recent history of France it has distinguished itself by political activity; the first time during the French Revolution under the leadership of Hébert, Danton, Santerre, and others in 1792; the second time during the interregnum following the Franco-Prussian War, when a General Council of 90 members was elected by the citizens of Paris on Mar. 26, 1871 to act as a government in opposition to the National Assembly led by Thiers and sitting at Versailles. The grounds of difference between the two bodies were many and various. The National Assembly was controlled by Monarchists; the Commune of Paris represented the opponents of Monarchy and all that went with it. Further, the National Assembly had followed the precedent of Louis XIV in removing to Versailles and Paris wished to retain the national government within its walls as it had during the Revolution. Lastly, despite the fact that many of the supporters of the Commune were revolutionists of diverse affiliations, Socialists, Anarchists and Federalists, the population of Paris was fairly united in opposition to the Assembly which had passed the law enforcing the resumption of debt and rent payments. This measure coming at a time when business was at a standstill and thousands of workmen were unemployed, crystallized the feeling of the capital against a government that gave every sign of becoming as oligarchic and arbitrary as that of the Second Empire.

The National Guard, as early as Feb. 1871, had fortified Paris against any attack directed at the Republic, and had themselves precipitated hostilities by executing two of the generals of the Versailles Government. The latter, unable at once to quell the insurgents, merely awaited the return of French regiments from Germany to begin a regular siege of the capital—the second since the opening of the Franco-German War. The civil war, for such it turned out to be in length and bitterness, lasted from Apr. 2 to May 28, 1871. The last week of the conflict carried the fighting within the streets of Paris and was characterized by desperate atrocities on both sides. The

"bloody week" also witnessed the destruction of numerous public and private buildings by fires resulting from the bombardment as well as from incendiarism. The last of the *Communards* were finally cornered and shot down in the Père Lachaise cemetery. Since then, the cemetery named in honor of Louis XIV's confessor has become a Socialist shrine.

The ultimate result of the suppression of the Commune was a deep and lasting embitterment between the social classes involved. For the national government, once it had captured the city, spared no one in the work of crushing the revolutionary spirit. It is estimated that 17,000 men died in the two months' fighting. In addition, at least 9,000 were condemned subsequently for participation in the work of the Commune. The French court dockets were burdened with cases arising out of the insurrection for eight years after it had been put down. Thousands were deported to New Caledonia, and of the 350,000 denunciations made to the police, 43,000 were acted upon, resulting in a longer or shorter term of imprisonment. It was not until the republican Gambetta had made a moving plea for social forgiveness that a general amnesty was declared in 1879. J. B. A.

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**PARIS, CONFERENCE OF**, was held in 1919-20 to frame the peace treaties ending the WORLD WAR. In the two full months elapsing between the Armistice of Nov. 11, 1918, and the first preliminary meeting of the conference, considerable preparatory work had been done by research agencies of various countries in the way of gathering information. The broad lines of the organization of the conference were drawn up in the preliminary meeting of two ranking delegates from the United States, Great Britain, France and Italy, meeting on Jan. 12, 1919. At this meeting it was decided that the belligerent Powers were to be divided into two groups, according to their general or particular interests, and should be represented by plenipotentiaries varying from one to five, the Great Powers to have the latter number, and, further, that the main functions of the conference were to reside in a Supreme Council of the five Great Powers, though all the plenipotentiaries were to meet in the plenary sessions. Accordingly, 70 plenipotentiaries representing 32 nations and including the President of the United States, 11 prime ministers, 12 foreign ministers, and numerous lesser delegates, accompanied by experts of every description, financial, economic, legal, diplomatic and military, met in the first plenary session on Jan. 18, 1919, for purpose of organization. All the preliminary arrangements of Jan. 12 were approved, and M. Clemenceau was elected president. At the second session the protest of the lesser Powers at being relegated to a supernumerary position was effectively squelched by Clemenceau's reminder that the Great Powers were backed by 12,000,000 soldiers and must main-

tain control. No delegations from the defeated Powers were ever admitted during the negotiations. The Supreme Council, or the "Big Five" as it came to be known, consisting of two delegates from England, France, the United States, Japan and Italy, was, for all practical purposes, the real conference during the first two months. However, Japan participated in its work only in matters affecting the Far East. Then, on Mar. 25, in order to expedite the negotiations, President Wilson and Premiers Lloyd George, Clemenceau and Orlando agreed to meet in informal conference, and were immediately hailed as the "Big Four" by the Press. Later, when Italy withdrew temporarily because of her opposition to the settlement of the Adriatic question, the formulation of the most important matters was assumed by the "Big Three."

At the first plenary session there were created 27 commissions, later increased to 52, to investigate and report on special problems. Though the four Great Powers always had representatives on these commissions, the lesser Powers were given an important place on those dealing with matters with which they were particularly concerned. Specialists and experts joined the accredited diplomats in these commissions, which did much of the real work of the conference. Their reports had great and often decisive weight with the Supreme Council. Parts of them, like those of the commission on labor questions and on economic questions, were incorporated bodily in the final treaties. Important commissions were those on a League of Nations, on responsibility for war and guarantees, on reparation for damages, on international control of ports, waterways and railways, on financial questions, on inter-Allied naval and military affairs, and on territorial questions.

However, the council of the Great Powers, later the informal conferences of the Big Four and Three, became in the last resort the bodies in which in utter secrecy all the definitive decisions of the conference were reached. They gave sanction to every clause of every treaty. With the power of decision thus concentrated, the personalities of these bodies were tremendously significant. Theoretically their conclusions required the approval of the plenary session, but actually they were presented ready-made and were accepted en bloc. Only six plenary sessions were held before the treaty of peace with Germany was signed. The questions before the conference were infinitely complex and tremendously significant, involving a discussion of the constitution of a League of Nations, the difficult problem of reparation and compensations, the decisions regarding colonial possessions and European frontiers, the problems of disarmament and French security, of demobilization and reconstruction, etc. Wilson's FOURTEEN POINTS, which had been accepted by the German and the Allied Governments as the basis of peace, were overwhelmed during the course of the conference by the force of nationalistic interests, bolstered up by numerous secret treaties. After four months of deliberation the peace

treaty was tendered to Germany on May 7, 1919, and was signed by the German Government at Versailles on June 28, and ratified on July 9. The Treaty of St. Germain was signed by Austria on Sept. 10, 1919, the Treaty of Neuilly by Bulgaria on Nov. 27, 1919, the Treaty of Trianon by Hungary on June 4, 1920, and the Treaty of Sèvres by the Sultan on Aug. 10, 1920. *See also* LEAGUE OF NATIONS; VERSAILLES, TREATY OF. T. R. S.

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**PARIS, DECLARATION OF**, an agreement regulating maritime war promulgated by the Congress which met in Paris in 1856 to conclude terms of peace following the Crimean War. The representative of France proposed the declaration, which was then recommended by the plenipotentiaries of the remaining nations and adopted by Great Britain, Austria, Prussia, Russia, Turkey and Sardinia. The four rules laid down in the document were:

- 1) Privateering is and remains abolished.
- 2) A neutral flag covers the enemy's goods, except contraband of war.
- 3) Neutral goods, excepting contraband of war, are not liable to capture under the enemy flag.
- 4) Blockades, to be binding, must be effective, that is, must be maintained by a force sufficient really to prevent access to the enemy coast.

Although these provisions expressed the public opinion which had become articulate in many states during the course of the Crimean War, the Declaration of Paris was not universally accepted. True, within the year after the date of its signing, Apr. 16, 1856, more than 40 states adopted the four rules. Yet the United States refused to join, on the ground that it had no navy and must depend on privateers for naval defense. Likewise, articles 2 and 3 were never ratified by Great Britain, though the practice of that nation in subsequent wars to 1914 shows that it held itself bound by the terms of the agreement. Spain and the United States agreed to abide by it in the War of 1898. J. BA.

*See* Thomas C. Bowles, *The Declaration of Paris of 1856*, 1900; F. F. Piggott, *The Declaration of Paris, 1856*, 1919.

**PARIS, PACT OF**, a formal agreement between nations abjuring war as an instrument of national policy. ARISTIDE BRIAND, French Minister of Foreign Affairs, in a statement to the press on Apr. 6, 1927, suggested the renunciation of war as between France and the United States. The American Secretary of State, FRANK B. KELLOGG, pursued the informal suggestion, proposing an agreement to ban all war signed by all the nations. On Apr. 13, 1928, Secretary Kellogg invited the participation of the British, German, Italian, and Japanese governments. After a lengthy exchange of notes between the powers involved, a treaty declaring the abhorrence of the contracting powers to war "for the solution of international controversies," and expressing their intention to seek the

settlement of all conflicts among them by none but peaceful means, was signed by 15 nations, Paris, Aug. 27, 1928. The treaty was to remain open "as long as may be necessary for adherence by all the other powers of the world"; within a year 40 of the 49 countries invited to join the treaty had deposited their instruments of adherence. The text represented a compromise of Secretary Kellogg's original aims with the French insistence that only wars of aggression be outlawed. The pact was invoked for the first time, and without effect, in protest against Japanese aggressions in Manchuria in 1931.

**PARIS, SIEGE OF.** *See* FRANCO-GERMAN WAR.

**PARIS, TREATY OF**, 1763, a compact concluding the Seven Years' War, known in America as the FRENCH AND INDIAN WAR. British military and naval forces had far outclassed the continental allies, Spain, in the war since Jan. 4, 1762, and France. England was in military possession of Canada, the Ohio valley, the French West Indies, Cuba, the Philippine Islands and important posts in India. The Earl of Bute, prime minister of England, was eager for peace, however, and began secret negotiations leading to the signing of the preliminary pact on Nov. 3, 1762, at Fontainebleau. The definitive treaty, signed at Paris on Feb. 10, 1763, awarded to Great Britain all of India under European influence except Pondicherry and Chandernagore; Senegal in Africa; Canada, Nova Scotia, Cape Breton, the Ohio valley, and that part of Louisiana east of the Mississippi and north of the Manshac River and Lake Pontchartrain; and the West Indian islands, Tobago, Dominica, Grenada and St. Vincent. In exchange for Florida, Great Britain restored Cuba and the Philippines to Spain. France retained Guadeloupe, Goree, Martinique, St. Pierre and Miquelon, islands in the Gulf of St. Lawrence, and fish-drying rights on the west and north shores of Newfoundland. Louisiana west of Florida was privately conveyed by France to Spain, Nov. 3, 1762. The treaty was unpopular in England, where the concessions to France were thought unnecessary and unwise.

**PARIS, TREATY OF**, 1783, a treaty between Great Britain and the United States, closing the REVOLUTIONARY WAR. Negotiations were begun in Mar. 1782 by Benjamin Franklin, envoy at Paris, and Lord Shelburne, Prime Minister of Great Britain, and continued by an American delegation embracing Franklin, John Jay and John Adams meeting with Richard Oswald and Henry Strachey, British commissioners appointed by Lord Shelburne. The definitive treaty, signed Sept. 3, 1783, defined the northern boundary of the United States as, from east to west, the St. Croix River, the watershed of the highlands between the St. Lawrence River and the Atlantic Ocean, the 45th parallel and the Great Lakes to the source of the Mississippi west of the Lake of the Woods; the western boundary as the Mississippi to the 31st parallel; the southern boundary as the 31st parallel eastward to the Chattahoochee River, thence to the Flint River, to the head of St. Mary's River, and

along the middle of that stream to the Atlantic Ocean. Debts of American citizens to British creditors, mostly accrued before the Revolution, were to be paid in full sterling; the creditors were given authority to sue in American courts if necessary, and American creditors were given similar privileges in Great Britain. American citizens were conceded the right to fish in Newfoundland waters and the Gulf of St. Lawrence. An ineffectual stipulation in behalf of the LOYALISTS bound Congress to recommend that the several states afford redress to those whose estates had been confiscated or had otherwise suffered for loyalty to the British cause. Attempts of the American commissioners to insert clauses providing commercial amity between the two countries were frustrated, but in general the treaty was a diplomatic triumph for the American negotiators.

**PARIS, TREATY OF**, Nov. 10, 1898, a treaty ending the SPANISH-AMERICAN WAR. The American commissioners, William R. Day, Cushman K. Davis, William P. Frye, Whitelaw Reid and George Gray, practically dictated to the Spanish delegates at Paris the terms of definitive peace. Spain was held responsible for the Cuban debt of over \$400,000,000; the Philippine Islands were ceded to the United States for the sum of \$20,000,000, at which amount the Philippine debt was estimated; Spain relinquished all claim to Cuba, the United States assuming, for the duration of its occupancy, responsibility for protection of life and property; Porto Rico and Guam were ceded to the United States. The political status of natives of Spain remaining in the ceded territory was to be determined by the United States Congress. Because of ANTI-IMPERIALIST opposition in the United States to the acquisition of the Philippines, which had not been an overt object of the war, the treaty narrowly escaped defeat in the Senate, being ratified, Feb. 6, 1899, by but one vote more than the requisite two-thirds majority.

**PARIS, UNIVERSITY OF**, one of Europe's oldest, largest and most celebrated universities, situated at Paris, France. According to one tradition, it was founded by Charlemagne, in 780, for his favorite scholar, Alcuin. Though the truth of the tradition is doubtful, the university regards Charlemagne as its patron saint and celebrates his anniversary every 28th of January. Actually, however, the university came to life early in the 12th century in the cloisters of the Cathedral of Notre Dame. It was at first a school in which the new dialectics were taught, the teachers, of whom PIERRE ABÉLARD was one of the most influential, being authorized by the chancellor of the Cathedral. In 1200 it received a royal charter from Philip Augustus, and in 1211 a charter from Pope Innocent III. Somewhat later in the 13th century the institution moved from the cloisters to a new site on the left bank of the Seine. In about 1160 the university added to its curriculum faculties of law and medicine. LA SORBONNE, which was to become the most renowned school of theology in Europe, was opened in 1257. The term university was first used

to denote a collection of colleges in connection with the University of Paris (in a bull by Pope Urban IV, 1264). By the 14th century the university included 40 colleges. In medieval times the University of Paris was a model for such other great centers of learning as the universities of Oxford, Prague and Heidelberg. (See separate articles on these universities.)

During the Revolution the university was abolished, 1792, but was reopened under Napoleon in 1808. Throughout the 19th century it underwent various changes, and in 1896 it was completely reconstituted. Of the various colleges of the present university, by far the best known is the Sorbonne, which since 1886 has been the College of Science and Letters. The university's schools of law and of medicine are also noted. Numerous independent institutions are gathered around the university, the most notable among them being the Beaux Arts, the Collège de France, the Conservatoire, L'Ecole Normale Supérieure, the Polytechnic, L'Ecole des Arts et Métiers, L'Ecole des Ponts et Chaussées, and, now established at the Sorbonne, L'Ecole des Chartes and the important Ecole des Hautes Études. The principal library of the university is at the Sorbonne and contains over 1,000,000 volumes. The number of students who attend the university averages between 25,000 and 30,000 annually. In 1930 there was a faculty of 303 members headed by S. Charléty, Rector.

A recent development in student life, the *Cité Universitaire*, consists of special dormitories, grouped on a 70-acre tract of land near the Parc de Montsouris, and forming an international student center. The *Cité Universitaire* originated in 1920, when Émile Deutsch de la Meurthe donated 10,000,000 francs for the special housing of 350 French students. In 1921 the section of land was presented to the university, and housing facilities for 4,000 students, both French and foreign, were tentatively planned. The Homer Gage Foundation, established in 1927, provides for 250 American students. Other foundations already in existence in 1931, or contemplated, make provision for Canadian, Belgian, Argentine, Japanese, British, Bolivian, Venezuelan, Spanish, Dutch, Swedish, Czechoslovakian, Greek, Mexican and Brazilian students.

**PARISH**, the smallest unit for rural local government in England. Of ecclesiastical origin, the term is still applied to the area or the people served by a single church. In some southern American colonies, the term formerly described a subdivision of the COUNTY. In Louisiana the term is applied to what is elsewhere a county.

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**PARK, JOHN EDGAR** (1879- ), American educator and clergyman, was born in Belfast, Ireland, Mar. 7, 1879. He studied at New College, Edinburgh, Royal University, Dublin, and at Princeton Theological Seminary, and in 1903 was ordained. His first pastorate was the West Parish Church at

Andover from 1904-07; this was followed by 19 years of service at the Second Church at West Newton, Mass. In 1926 Park left the ministry to become president of Wheaton College, Norton, Mass. His several books include *The Keen Joy of Living*, 1907; *Parables of Life*, 1912, and *New Horizons*, 1929.

**PARK, MARION EDWARDS** (1875- ), American educator, was born at Andover, Mass., Dec. 31, 1875. She graduated from Bryn Mawr College, 1898, and subsequently studied at the University of Chicago and the American School of Classical Studies at Athens, Greece. From 1902-06 she was instructor and assistant professor of classics at Colorado College. She became dean of Simmons College in 1918, dean of Radcliffe College in 1921, and president of Bryn Mawr College in 1922.

**PARK, MUNGO** (1771-1806), Scottish explorer, was born near Selkirk, Scotland, Sept. 10, 1771. In 1795, as a representative of the African Association, he was sent to explore the course and source of the Niger River. After exploring the Niger and visiting Segou, he returned to England in 1797, two years later writing the book, *Travels in the Interior of Africa*. In 1805 the British government sent Park in charge of an expedition to continue explorations of the Niger; after navigating more than 1,000 mi. he was drowned near Busa.

**PARK COLLEGE**, at Parkville, Mo., a coeducational institution established in 1875, is privately controlled, cooperating with the Presbyterian Church. It had productive funds in 1931 totaling \$1,714,000. The library contained 35,000 volumes. In 1931-32 there were 525 students and a faculty of 36, headed by Pres. Fred W. Hawley.

**PARKER, ALTON BROOKS** (1852-1926), American lawyer and jurist, was born at Cortland, N.Y., May 14, 1852. He was graduated from Albany (N.Y.) Law School in 1873. After serving in New York State as county surrogate in 1877, justice of the Supreme Court in 1886, the Court of Appeals in 1889, and as chief justice of the latter body in 1898, he accepted the Democratic nomination for the Presidency in 1904, but was defeated by Theodore Roosevelt. Following his defeat Judge Parker opened a law office in New York City, and was frequently counsel in litigation before the United States Supreme Court. He died at New York City, May 10, 1926.

**PARKER, SIR GILBERT** (1862-1932), Canadian novelist, was born at Camden East, Ont., Nov. 23, 1862. He attended Trinity College, in Toronto, and after traveling widely he settled in London in 1897, the year after his popular novel, *The Seats of the Mighty*, was published. The following year this novel was successfully dramatized, and other books followed. In 1900 and in 1906 Parker was elected to Parliament; he was knighted in 1902, and made a baronet in 1915 and a privy councillor in 1916. Among his widely read books are *The Battle of the Strong*, 1898, *The Lane That Had No Turning*, 1900, *The Right of Way*, 1901, and *The Promised Land*, 1928. Parker died at London, Sept. 6, 1932.

**PARKER, HORATIO WILLIAM** (1863-1919), American music composer, was born at Auburndale, Mass., Sept. 15, 1863. He went in 1881 to Munich, where he worked at theory and the organ under Rheinberger. He filled various posts as organist at New York and Boston. In 1893 his oratorio, *Hora Novissima*, was produced at New York. He became professor of music at Yale in 1894, in which post he remained until his death, at Cedarhurst, N.Y., Dec. 18, 1919.

**PARKER, MATTHEW** (1504-75), first archbishop of Canterbury under Queen Elizabeth, was born at Norwich in 1504. He graduated from Cambridge and in 1535 was appointed dean of St. Clare. Four years later he became chaplain to Henry VIII and, in 1544, master of Corpus Christi College, Cambridge. He was dean of Lincoln after 1552. When Queen Mary came to the throne, Parker lost his offices, probably because he was unsympathetic to the new regime. He lived in retirement until the accession of Queen Elizabeth in 1558. He was then made archbishop of Canterbury. It was under Parker's sponsorship that the *Bishop's Bible* was published. He also had an important part in forming *The Book of Common Prayer*. Parker died at London May 17, 1575.

**PARKER, THEODORE** (1810-60), American clergyman, was born in Lexington, Mass., Aug. 24, 1810, and studied at Harvard Divinity School. In the pastorate of the West Roxbury Unitarian Church, which he assumed in 1837, he broke away from the conservative Unitarian element and fearlessly preached a non-supernatural Christianity. His sermons stirred up strife even in his own church, and in 1845 he removed to Boston, where he preached in a public hall before what he called "The Twenty-eighth Congregational Society of Boston." He relinquished this work in 1859, and died in Florence, Italy, May 10, 1860.

**PARKERSBURG**, a manufacturing city of West Virginia, and county seat of Wood Co., on the Ohio River at the mouth of the Little Kanawha River, 65 mi. north of Charleston. The Baltimore and Ohio and the Little Kanawha railroads serve the city, and there are interstate bridge and steamboat connections. Parkersburg has progressive industries, manufacturing artificial silk, Vitrolite glass, oil-well machinery, shovels and other products. In 1929 the factory output reached approximately \$16,000,000; the retail trade amounted to \$16,978,572. The vicinity has abundant resources of oil and gas, coal and fire clay. Important trade in petroleum and substantial farming commerce center in the city. Nearby points of historic interest include Blennerhassett Island and Fort Boreman. Parkersburg was founded in 1789 and became a city in 1863. Pop. 1920, 20,050; 1930, 29,623.

**PARKES, SIR HARRY SMITH** (1828-82), British diplomat, was born at Bloxwich, Staffordshire. He went to Macao as a boy of 13 to be with his sisters. The next year, because of his knowledge of the local language, he was put on the staff of the British diplomatic agent in the area. He entered the British



consul service in 1843, starting at Canton, and subsequently served at Foochow, Shanghai and Amoy. He took an active part in the development of British interests in China and the neighboring countries, being directly concerned in the disturbances at Canton and other cities in the 1845-60 period. He also negotiated the Anglo-Siamese trade treaty in 1855. British naval vessels under his command took part in fighting in Japanese waters with the purpose of compelling the authorities at Shimonoseki and Osaka to open up the country to foreign trade in accordance with the instructions of the shogun at Tokyo. In 1865 he was made British Minister to Japan, and he held this post until his transfer to Peking in 1882. During his service in Japan he showed himself particularly aggressive in developing opportunities for British trade in Japan, his aggressiveness arousing considerable Japanese ill-feeling. He died in Peking Mar. 21, 1885.

**PARKHURST, CHARLES HENRY** (1842- ), American clergyman, was born in Framingham, Mass., Apr. 17, 1842. He studied theology at Halle and Leipzig, and in 1874 became pastor of the Congregational Church at Lenox, Mass. In 1880 he was called to the Madison Square Presbyterian Church, New York, where he remained until 1918. He was prominent in civil and social reforms and prompted the investigation of municipal corruption by the Lexow committee. His writings include *The Blind Man's Creed, Our Fight with Tammany*, and *My Forty Years in New York*.

**PARKMAN, FRANCIS** (1823-93), American historian, was born at Boston, Mass., on Sept. 16, 1823. His determination while a student in Harvard to be the historical interpreter of the last French war in America resulted after years of research and preparation into his great seven-volume series of historical works dealing with the struggle between France and England for mastery in America. The first volume, *Pioneers of France in the New World*, appeared in 1865 and the last one 27 years later, just before his death. Such volumes as *The Old Régime in Canada, A Half Century of Conflict*, and *Montcalm and Wolfe* established his place in American literature as well as in historiography. His *Conspiracy of Pontiac* still remains the best description of that frontier episode. Parkman was indefatigable in his efforts to secure source material for his works, and seriously impaired his health gathering data for the *Oregon Trail*. Most of his writing was done under the tremendous handicap of physical frailty and bad eyesight. He died at Jamaica Plain, Mass., on Nov. 8, 1893.

**PARK RIDGE**, a residential suburban city in Cook Co., northeastern Illinois, situated on the Des Plaines River, 13 mi. northwest of Chicago. Several bus lines and the Chicago and Northwestern Railroad serve the city. Park Ridge was founded in 1867 and incorporated in 1910. Pop. 1920, 3,383; 1930, 10,417.

**PARKS**, land or water areas publicly and permanently set aside for either active or passive recrea-

tional purposes in which the recreation is expected to come in part at least from beauty of appearance. Well-planned urban park systems show not only adequate total area—a widely accepted standard prescribes one acre to every 100 population—but also a balanced relationship and an adequate distribution as to fundamental types of properties—such as landscaped triangles and plazas, children's playgrounds, neighborhood playfields, neighborhood parks, large parks, water-fronts, reservations and parkways.

In 1926, 1,681 communities owned 248,000 park acres, valued at \$3,000,000,000. Probably one-third of these acres were donated, the balance publicly purchased. Annual operating expenses are at least \$100,000,000.

In the United States parks of the reservation type are provided by cities, by county, state and federal governments. In 1926, 109 cities reported extra-urban parks; in 1929, 66 counties reported 317 county parks totaling 105,000 acres. In 1930, 39 states reported over 600 state parks aggregating over 2,750,000 acres; also 2,750,000 acres of state forests and 500,000 acres of state game areas. Most of the other states have comparable areas under various designations.

In 1930, the Federal Government had 159 forests with over 158,000,000 acres used recreationally by 31,750,000 people; 23 national parks of 7,955,829 acres; 64 national monuments; 11 military parks and 84 federal game and bird refuges, aggregating nearly 5,000,000 additional acres.

R. S. W.

**PARLEMENTS**, superior courts of law under the ancient régime in France. Thirteen in number, they were located in Paris and approximately in the 12 other largest cities of France. Each had appellate jurisdiction in its region; but the Parlement of Paris, because of being associated with the capital, had a larger territory and a more distinguished personnel. As a result it enjoyed a prestige and leadership held by none of the others. Out of the practice of having the parlements register the royal decrees the parlements protested from time to time against doing so, because the decree ran counter to the laws already in force or because it was unpopular. In this manner a shadowy veto against the king's power was developing before the Revolution, especially with the Parlement of Paris. When the Parlement refused to register a royal decree, the king either accepted the protest and withdrew it or appeared in person with his officials, and, in what was known as a "bed of justice," ordered that the decree be registered. Sometimes the Parlements would refuse even then. In such cases the king would have the members arrested and imprisoned or sent into exile to the provinces. With the reorganization of the administrative and financial systems of France by the National Assembly, the parlements were abolished.

See Henri Carré, *La fin des parlements, 1789-98*, 1912.

**PARLIAMENT**, the supreme British legislative body, is a bicameral assembly comprising an upper chamber or House of Lords and a lower chamber or House of Commons. The Crown has theoretical con-



trol over proroguing and dissolving Parliament, but the Cabinet, really a committee of the dominant party in the Commons, possesses the actual power. The origin of Parliament dates back to the Witenagemot or "meeting of the wise" of Anglo-Saxon times. It assumed something of its present form by the year 1295 when Simon de Montfort's plan was adopted of forming a lower house on a popular basis. The House of Lords includes lords spiritual, appointed by the Crown for life, and lords temporal whose seats may be hereditary or for life. The history of England has been a constant struggle on the part of the Commons to gain the upper hand. The reform bills of 1832, 1867 and 1884 have extended the franchise and increased the power of the Commons. The Parliament Act of 1911 curbed the power of the lords. S. C. W.

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**PARLIAMENT, HOUSES OF**, or The New Palace of Westminster, London, the meeting place of the British government, was begun in 1840 by Sir Charles Barry on the site of the Old Palace of Westminster, and was completed by his son, Edward M. Barry, in 1868. Built of Yorkshire limestone in a lavish Perpendicular Gothic style, the edifice covers 8 acres of ground. It contains 13 courts, 100 staircases and more than 500 apartments and cost approximately \$15,000,000. Three towers rise above the picturesque mass: the Central Tower, 300 ft., the Clock Tower, 316 ft., with the famous Big Ben bell, and the Victoria Tower, 336 ft. The northern side is embellished with statues of Anglo-Saxon kings, and the opposite side bears statues of English sovereigns from William the Conqueror to Victoria. The three most interesting rooms are the richly decorated House of Lords, 90 ft. by 45 ft. by 45 ft., containing the thrones of the king and queen, the Woolsack, the bar and various galleries; the much simpler House of Commons, 75 ft. by 45 ft. by 41 ft.; and the octagonal Central Hall, 60 ft. in diameter and 75 ft. high. St. Stephen's Hall occupies the site of St. Stephen's Chapel, founded by King Stephen in 1141, rebuilt by Edward III in 1348, and used by the Commons from 1547 to 1834. The historic Westminster Hall, the chief relic of the Old Palace, was begun by William II in the 11th century, and is noted for its magnificent timber roof, built by Hugh Herland, Richard II's carpenter. The Hall, 240 ft. long, 67 ft. wide and 92 ft. high, was restored in 1922.

**PARLIAMENTARY LAW**, the set of rules governing the procedure of deliberative bodies. Assemblies are organized under a presiding officer who declares the meeting in session, maintains order and discipline, puts motions to the vote and decides the proper procedure in cases of dispute. Usually he does not participate in debate although he is so privileged; customarily he votes only in the event of a tie. A proposal is brought before the assembly as a motion or resolution which usually must be seconded before it receives consideration. It is then opened to discussion by the chairman and has prece-

dence over all except specially privileged motions or subsidiary motions intended to dispose of the motion before the meeting. Thus it may be moved to lay the motion on the table (defer it indefinitely); to demand the previous question (stop the discussion and vote immediately); to postpone the ballot until a definite date or to refer the proposal to a committee. Such motions are voted on before proceeding with the original motion. Most motions are subject to a motion to amend, which must be seconded before consideration. The precedence of motions usually depends on the order in which they are presented with the exception that certain motions are privileged. Thus, a motion to adjourn or to establish procedure takes precedence over an ordinary motion.

After a motion has been put by the chairman and all related motions have been disposed of, the chair puts the question (submits the measure to the vote of the assembly). The vote required for adoption varies with the nature of the question and the particular rules under which the assembly functions.

General rules of parliamentary law are secondary to rules of order as prescribed in the by-laws of an organization but a standard code of parliamentary law is usually made authority on questions not so specified.

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**PARLIAMENT OF FOWLS** ("Parlement of Foules"), an allegorical and humorous poem by GEOFFREY CHAUCER dating from the 14th century. The poem opens with an epitome of Cicero's *Somnium Scipionis*, and a long passage is borrowed from Boccaccio's *Teseide*. The last part of the poem, which is the most interesting and most original, contains delightful satire on human nature and on the English Parliament of the day in its description of the different birds and their debate. Many scholars have found in the poem an allegory of a proposed royal marriage, but no theory of this has yet been satisfactorily established.

**PARMA**, the capital of the province and former duchy of the same name in north central Italy. It is the seat of a bishop, and of a university, founded 1512. The city is famous as the home of Antonio Allegri, surnamed CORREGGIO, the great master of chiaroscuro. The main street is the ancient Via Aemilia, which intersects the Piazza Grande containing fine statues of Correggio and Garibaldi. Of more than 60 churches, the cathedral, in Lombard-Romanesque style of the 12th century, is the oldest. Near by is a later Romanesque baptistery in marble. Other churches are those of San Giovanni Evangelista, 1510, and Madonna della Steccata, the finest Renaissance church in Parma, 1521-39. A hall of the former convent of San Paolo was painted with mythological frescoes by Correggio in 1518. Among the secular buildings are the Palazzo Ducale, Palazzo del Giardino, and Palazzo della Pilotta. The city became a Roman settlement in 183 B.C. It had a high standing during the Lombard period, but for centuries afterward was under the power of various noble

families or political parties, among them the Guelphs, the Ghibellines, and the Sforzas. In 1860 it became a part of the kingdom of Italy. There are many schools, technical and professional, also museums, libraries and picture galleries. Parma has iron foundries, tanneries, silk and other factories and a large trade in agricultural products. Pop. 1931, 71,282.

**PARMENIDES** (c. 500 B.C.), Greek philosopher of Elea who was at his height about 500 B.C. He began as a Pythagorean and later became one of the leaders of the Elatic School. His writings have come down to us in the form of a poem, which is the earliest relic of systematic metaphysical speculation among the Greeks. The first part of the poem is dedicated to Truth, the second to opinion or illusion.

Parmenides argues that the One is all that is. This One is eternal, immutable, immovable, indivisible, continuous and unique. All change is denied, and multiplicity is but an illusion. Logically the argument proceeds by dilemmas and contradictions.

**PARNASSUS**, a mountain of the Phocis Valley of Greece, a part of a range of mountains bearing the same name which extend from Oeta and Corax southeast to the Corinthian Gulf. Parnassus is at its greatest extremity 8,070 ft. high and because of its two chief peaks, Tithorea and Lycorea, is often described in poetry as double-headed. The town of DELPHI is on the south side of the mountain. Parnassus is celebrated in mythology as the home of the MUSES and of APOLLO and hence was regarded by ancient writers as a source of inspiration. Dionysus also was supposed to haunt its slopes, and on Mt. Lycorea was the Corcian Cave, from which the Muses were sometimes called the Corcian nymphs. Issuing from two cliffs called Nauplia and Hyampolia near the base of the mountain was the Castalian spring. Just west of this was the shrine of the Delphic oracle.

**PARNASSUS, PA.** See NEW KENSINGTON.

**PARNELL, CHARLES STEWART** (1846-91), Irish political leader and Nationalist, was born at Avondale, Co. Wicklow, June 27, 1846. Parnell first entered parliament in 1875, and with Joseph Biggar he organized an Irish bloc. By such measures as indefinite discussion to bring about all-night sessions (filibustering), Parnell and his associates strove to secure legislative independence for Ireland. In 1880 while representing Cork, he became chairman of the Irish parliamentary party. When Gladstone returned to power in 1880; Parnell's associates launched a campaign to boycott British goods. The ensuing disturbances led parliament to pass a Crimes Act, in 1881, and Parnell was arrested. Crimes increased in Ireland, and on his pledge to help put an end to violence he was released in 1882. Four years later Gladstone supported the Home Rule measure of the Irish Nationalists, and although the bill failed to pass, he and Parnell became close associates. In 1887 Parnell was charged by the London *Times* with complicity in crimes of violence in Ireland. He sued for libel, and was awarded damages of \$25,000. By his

marriage to Mrs. O'Shea, the divorced wife of Captain O'Shea, in 1891 he lost the support of the Catholic elements of the party and this split lost him its leadership. He died the same year on Oct. 6, 1891, at Brighton, Sussex.

**PARNELL, THOMAS** (1679-1718), Irish poet, was born at Dublin in 1679. He was educated at Trinity College, Dublin, and took orders in 1700. He was successively archdeacon of Clogher, prebendary of Dublin Cathedral, and vicar of Finglas. He helped ALEXANDER POPE with the translation of Homer, and wrote the introductory essay. His poems were published in 1721, his *Posthumous Works* in 1758. Failure of further advancement and the death of his wife darkened Parnell's later years. He died at Chester, England, in Oct. 1718.

**PÄRNU (PERNAU)**, a seaport town of Estonia, situated on the Parnu River at its mouth in the Gulf of Riga. The town is about 100 mi. northeast of Riga itself. It is a busy shipping point and watering place. The exports are timber, flax and wood pulp and the imports, coal, corkwood, salt and herrings. Pärnu was founded in 1255. Est. pop. 1931, 20,885.

**PAROCHIAL SCHOOLS**, sometimes called parish schools, are those private educational institutions which are established, maintained and governed by religious organizations or churches. Tracing their origin to the catechetical schools of the early Christian Church, they have been an important factor in the evolution of elementary education in most Christian countries. In the United States the denominational control of education still involves about a dozen churches, the chief of which are the Roman Catholic, by far the most important, and the Lutheran. The latter has about 6,000 parish schools with approximately 300,000 pupils, whose teachers outside the primary grades are mostly men. In 1928 high schools and private academies maintained by the Baptists numbered 68 with 7,145 pupils; Congregationalists, 15 schools with 1,265 pupils; Episcopalians, 82 schools with 7,310 pupils; Friends, 23 schools with 2,571 pupils; Latter Day Saints, 2 schools with 1,337 pupils; Lutherans, 26 schools with 3,016 pupils; Methodists, 81 schools with 9,344 pupils; Presbyterians, 60 schools with 5,405 pupils; Catholics, 1,345 schools with 158,612 pupils, and the Seventh Day Adventists, 35 schools with 3,159 pupils.

The parochial schools of the Roman Catholic Church date from the earliest days of the French and Spanish colonies in the United States, and they form one of the most monumental illustrations in modern times of successful effort to establish an educational system which protests what they term "the secularization of state supported schools." Archbishop Spalding is often quoted in this connection: "The greatest religious fact in the United States to-day is the Catholic School system, maintained without any aid by those who love it." About a century ago, a few of these schools in New England secured a share in the public funds, but this began to cease after the persecution

which was engendered by the Know-Nothing movement of 1852. To-day the Church supports the educational system; but large numbers of Catholics maintain that thereby they suffer an injustice, being indirectly obliged to pay for what the state should provide. On the other hand there are many Catholics who hold that state aid would involve the de-Catholicization of their schools and the loss of independence.

In 1931, there were about 20,000 parochial school teachers in charge of about a million and a half pupils in elementary schools whose property had an aggregate value of about \$100,000,000. The cost of the system is about \$20,000,000 annually.

**PARODY**, originally the Greek name for a comic imitation of a poem; later the term was used for a clever imitation which ridiculed the substance and style of either poetry or prose. Parodies have been written, among the Greeks, by Hipponax who parodied the *Iliad* (6th century B.C.); Hegemon of Thasos and Aristophanes; among the Romans, by Lucian, Plautus and Ovid. Medieval parodies often mimicked the Bible, Church liturgy or took the form of humorous testaments. Milton's *Paradise Lost* was parodied by John Philips in his *Splendid Shilling*, 1703; Richardson's *Pamela* by Fielding in *Joseph Andrews*. Excellent modern parodies have been written by James and Horace Smith in *Rejected Addresses*, 1812; R. H. Barham (*Ingoldsby Legends*, 1840); Aytoun and Martin (*Bon Gaultier Ballads*, 1854); and by Sir Owen Seaman, Thackeray, Hood, Lewis Carroll, J. K. Stephen, C. S. Calverley, Bret Harte, Mark Twain, Stephen Leacock and Max Beerbohm.

**PAROLE**, in law, is frequently used to signify something oral, or spoken. Parole evidence is the oral testimony of a witness. Literally, parole, or parol means a word. In some states of the United States acts have been passed permitting the release of convicted persons on parole, on promise of good behavior. In time of war a prisoner of war may, if the laws, regulations and orders of his country permit, be released upon condition, for example, that he refrain from again taking up arms against the captor government during the pending war. U.S. Army Regulations also provide for the release of a prisoner under sentence adjudged by a court-martial, who has complied with certain conditions and agrees to comply with other stated conditions. E. A. K.

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**PAROS** or **PARO**, an island in the Cyclades archipelago in the Aegean Sea, consists mainly of one mountain about 2,500 ft. high, Mt. St. Elias, the ancient Mt. Marpessa. From this mountain came the famous Parian marble. Arcadians were the first colonists, later Ionians settled on the island. In the 5th century B.C. Paros was a member of the Delian League. In 490 B.C. it was conquered by Persia, later passed to Egypt and still later to Rome. The **PARIAN CHRONICLE** takes its name from having been discovered here.

**PAROTITIS.** See MUMPS.

**PARQUETRY.** See FLOORING, WOOD.

**PARR, SAMUEL WILSON** (1857-1931), American chemist, was born at Granville, Ill., Jan. 21, 1857. After graduating from the University of Illinois in 1884, he studied in Europe and became professor of applied chemistry at the University of Illinois in 1891 where he devised special types of calorimeters for industrial uses. In 1905 he acted as director of the Illinois State Water Survey and consultant chemist to the State Geological Survey. He died in 1931.

**PARR**, the term applied to young SALMON (*Salmo salar*) before they descend, in their second or third year, from the rivers to the sea. They become about 8 in. long and are characterized by various black and orange spots, and a series of 12 or more broad bluish cross bars on the sides and tail. The young of nearly all members of the salmon family, including the trout and grayling, pass through a similar stage.

**PARRAKEET**, also spelled paroquet, the common name for various middle-sized birds of the parrot family. The true parrakeets form an exclusively Old World group of about 125 species with predominantly green plumage. A widely known example is the rose-ringed parrakeet (*Palaeornis torquata*), about 16 in. long with a tail 10 in. long, very abundant in India where it is commonly domesticated. Related American groups are also called parrakeets, as the green parrakeet (*Myopsittacus monachus*), of Argentina, which builds enormous hanging nests in trees. The closely allied Carolina paroquet (*Conuropsis carolinensis*), about a foot long, green with a brilliant orange-yellow head, is the only native American paroquet found north of Mexico. Formerly distributed widely in the eastern United States this handsome bird, through wholesale destruction from various causes, is now extinct, being last seen in 1904.

**PARRHASIUS**, Greek painter, son of Evenor, was born at Ephesus, in the 5th century B.C. He was a citizen of Athens and did much of his work there. Parrhasius is considered one of the greatest of ancient painters. Tradition has it that he was the first to establish true proportions in a picture and to indicate the round by light and shade. At the time of Pliny many of his works were still in existence, and Pliny's anecdotes indicate that Parrhasius carried realism to the point of actual illusion. His principal works were *The Personification of the Demos of Athens*, a *Prometheus* and a *Theseus* which later appeared in Rome. Many of his drawings were considered valuable by later painters for purposes of study. The date of Parrhasius's death is unknown.

**PARRISH, ANNE** (1888- ), American novelist, was born at Colorado Springs, Colo., Nov. 12, 1886, and educated in private schools. In 1915 she married Charles Albert Corliss of New York City. Her first successful book was *The Perennial Bachelor*, published in 1925 and awarded the Harper prize. Subsequently she wrote *Tomorrow Morning*, *All Kneeling*, *The Methodist Faun*, 1929, and *Loads of Love*, 1932.

**PARRISH, MAXFIELD** (1870- ), American illustrator and painter, was born at Philadelphia, Pa., July 25, 1870. He attended Haverford College, studied at the Pennsylvania Academy of Fine Arts and was a pupil of Howard Pyle. Parrish has done many illustrations for magazines, and has been unusually successful in illustrating children's books, such as Eugene Field's *Poems of Childhood* and Wiggin and Smith's version of *The Arabian Nights*. He has also painted murals for buildings in New York, Philadelphia, Chicago and San Francisco. The artist became a member of the National Academy in 1906.

**PARROT**, any bird of the order *Psittaciformes*, characterized by a swollen, hooked beak, by feet adapted to walking, climbing or grasping, and by strongly contrasted colors, green predominating. Parrots are tropical and embrace in two families over 600 species, mostly natives of the East Indies, Australasia and South America. In addition to the



PIGMY PARROT  
*Nasiterna pygmaea*

familiar pet parrots and parrakeets, the typical family, *Psittacidae*, includes the diminutive love-birds, the gigantic macaws and cockatoos, and others varying greatly in size, color, and habit. The second family, *Loriidae*, includes the lorries or brush-tongued parrots. Parrots are usually found in companies, composed of pairs that remain close together. The greater number inhabit trees, yet often descend to the ground, where they walk easily, and a few species are really terrestrial in habit, seeking food and even making nests in the grass.

Parrots as a class may be called omnivorous, the likings of the various species running from grass-seeds, insects and honey, to all forest fruits and the hardest nuts; and they alone among birds habitually manipulate their food with their claws. Certain kinds prefer clambering about among rocks and nesting in their crevices; but most of them choose or bore holes in tree-trunks in which to place their white eggs. The best and most common pets and talkers are the African gray parrot and the South American amazons, which are good-tempered and learn readily. E. I.

**PARROT FISH**, the name applied to the numerous spiny-rayed, marine fishes of the family *Scaridae*,

allied to the wrasses (*Labridae*), and especially to those of the genus *Scarus*. They are abundant in the Indo-Pacific region and are also found in the warm Atlantic, several species occurring in tropical American waters. The parrot fishes, usually brilliantly colored, are mostly of large size, some 3 ft. in length, and have oblong, moderately compressed bodies covered with large scales. They are remarkable in that the jaw teeth are usually fused together forming a sharp-edged, somewhat parrot-like beak. Most species subsist upon small marine plants but some feed largely on coral. Their flesh, usually of poor quality, is in some species poisonous. The scarus (*Spari-soma cretense*) of the Mediterranean, highly esteemed by the Romans, is, however, an excellent food fish. See also WRASSE.

**PARSEC**, the unit of distance in the universe corresponding to a parallax of one second of arc and equal to 3.26 light years, or 19,200,000,000,000 miles. See PARALLAX.

**PARSIFAL**, an opera in three acts by RICHARD WAGNER, libretto based on medieval French and German legends by the composer; première, Bayreuth, 1882, New York, 1903. The last of Wagner's operas, it differs from all its predecessors save *Lohengrin* in dealing with a Christian legend, the Holy Grail. He himself called it a Bühnenweihfestspiel (or consecrational stage festival play). According to the terms of his will, it was not to be produced save in the Bayreuth Festspielhaus until 1913, thirty years after his death; but in defiance of these provisions the Metropolitan Opera Company, New York, produced it a decade earlier. *Lohengrin* was a son of Parsifal, but there is no other bond between these two Wagnerian operas.

The Holy Grail is the cup from which Christ drank at the Last Supper, and into which his blood was poured after he was wounded by a soldier's spear. Both the cup and the spear came into the hands of Tituril, according to legend, and were placed by him in the temple Monsalvat. He chose knights noted for their purity to protect them, and, nearing his end, gave them into the custody of his son, Amfortas.

Near Monsalvat lives a magician, Klingsor, who has vainly tried to join the Knights of the Holy Grail. Rebuffed, he seeks his revenge by peopling his gardens with sirens who attempt to seduce the knights. Chief among these sirens is Kundry, a mocking woman who actually is Herodias who laughed at Christ on the Cross and was condemned to wander the earth and taunt its suffering. Armed with the sacred spear, Amfortas goes forth to subdue the sorcerer Klingsor, but instead of accomplishing this he succumbs to the charms of Kundry, losing the spear and being wounded by it. He returns to Monsalvat in deep penitence, wounded in body and spirit.

To regain the spear is now the deepest concern of the knights; and one of the older ones, Gurnemanz, sees in Parsifal, a guileless lad, the perfect emissary, although he apparently cannot grasp the significance of the untoward happening and consequently is not ready for the honor. Wandering far from Monsalvat,

the lad comes to the castle of Klingsor. Once inside the castle grounds he is surrounded by a group of maidens led by Kundry. Suddenly she kisses him. The defilement of her lips awakens his sense of sin, and for the first time he comprehends the wound from which Amfortas suffers. He flings Kundry from him, while she calls to Klingsor for succor. The sorcerer instantly appears, hurling at Parsifal the sacred spear; but it is magically halted in its flight, and suspended over the head of Parsifal who seizes it, making the sign of the Cross. In a twinkling the palace crumbles, the sorcerer vanishes, and only Kundry and Parsifal are left alone in a desert. Years pass. It is Good Friday. Titurel is dead, awaiting burial. Kundry, repentant, has become the devoted servant of Gurnemanz. A knight girt in black armor approaches. It is Parsifal returned from his long wanderings. He carries the sacred spear, touches Amfortas's wound which heals instantly, and prepares in the goblet the sacred Eucharist which he raises aloft while the knights kneel in homage and Kundry dies, forgiven by heaven.

**PARSIS** and **PARSIISM**. The Parsis (so-called from their former home in the Persian province of Fars), numbering about 90,000 in Bombay, chiefly, are a flourishing and respected community of followers of the ancient Iranian prophet, ZOROASTER. Their ancestors fled from Persia to India in the 7th century, to escape the hardships imposed by the Moslem conquerors of their homeland. The tradition is that the fires on their Indian altars perpetuate those which burned in their ancient homeland. The Parsis are not "fire-worshippers," nor yet "sun-worshippers." They worship AHURA MAZDA whose symbols are the sun and fire. The Parsi fire-temple is unpretentious. There is no regular, special day of worship. Men and women, freely mingling, visit the temples daily, offer their prayers, and replenish the undying flame with fragrant sandal-wood. Nor is the temple a place of moral and religious instruction, save indirectly through readings from the sacred scripture and religious discussions. The priests, however, receive systematic instruction in details of their office. The priestly succession is hereditary.

Modern Parsiism is wrapped up in its ceremonial. Along with the fire-temple and its ritual, there is also the "tower of silence" (*dakhme*) where the dead are laid away and left to be devoured by birds. When a Parsi dies his body is taken by special officers of the cult and placed inside the tower over one of the pits. The bones are thrown at last into the central pit where they crumble to dust. While in Zoroaster's day bodies were buried, the *dakhme* method is in accord with the prevalent view of the sacredness of fire, water, earth and air.

**PARSLEY** (*Petroselinum sativum*), an aromatic plant of the parsley family widely grown for flavoring and garnishings. It is a native of the Mediterranean region and, though known to Pliny and Dioscorides as a wild medicinal plant, there is no evidence of its cultivation until Charlemagne in the

Middle Ages ordered it planted in his gardens. English gardeners began to grow it about 1548. It is a smooth biennial with much branched stems about 2 ft. high bearing divided leaves which in some varieties are much curled and crisped. A form (var. *radicosum*), with a thick parsnip-like edible root, is grown under the name turnip-rooted parsley.

Parsley thrives in any good soil. As the seeds sprout slowly, a few forcing radish seeds should be sown with them to indicate the rows so that tillage may begin within a week. The plants should be thinned to a foot apart and given clean cultivation. Parsley makes a pretty edging for flower beds, but must be renewed annually.

**PARSNIP** (*Pastinaca sativa*), a vigorous biennial of the parsley family cultivated for its thickened tap root used as a winter and spring vegetable and as a stock food. It is a native of northern Asia and central and southern Europe, brought into cultivation during the Middle Ages, and now very widely naturalized as a wayside weed, especially in North America. The white, fleshy, somewhat mucilaginous root sometimes attains a length of 20 in., tapering from a crown 4 in. in diameter. It gives rise to smooth branching stems, 3 to 5 ft. high, bearing leaves composed of numerous deeply cut or toothed leaflets and yellow flowers in compound clusters (umbels). In the United States the parsnip is a minor vegetable, being grown chiefly in the more northern states and usually in limited quantities. It is a slow grower requiring a long period to reach maturity, but is uninjured by winter freezing if allowed to remain in the soil until spring. The wild form has an acrid somewhat poisonous root.

**PARSON BIRD** (*Prosthematodera nove-zealandia*), a remarkable bird of the honey eater family (*Meliphagidae*), called also Tui, native to New Zealand and the Australian islands. It is about a foot long and glossy bluish or greenish black in color, with faint white streaks on the back of the neck and a tuft of curly white feathers on each side of the throat. The parson bird is noisy and active and nests in bushes laying 3 or 4 white eggs, often variously marked with brown. It feeds largely upon honey and insects, which it extracts from flowers by means of its long, brush-tipped tongue. Because of its high powers of mimicry and its ability to learn to speak short sentences and whistle bits of tunes, the parson bird is much prized as a cagebird.

**PARSONS, SIR CHARLES ALGERNON** (1854-1931), English engineer, born at London, June 13, 1854. Educated at St. John's College, Cambridge, he was employed in marine engineering until 1889 when he established his own plants at Newcastle. In 1884 Parsons had invented the compound steam turbine and his improvement in condensers in 1891 enabled him to build the first turbine driven steam ship, the *Turbina*, in 1897. In 1910 he perfected mechanical reducing gears for turbines. Parsons was elected to the Royal Society in 1898 and knighted in 1911. He died in the West Indies, Feb. 12, 1931.

**PARSONS, WILLIAM BARCLAY** (1859-1932), American civil engineer, born at New York City, Apr. 15, 1859. In 1882 he obtained a degree in civil engineering at Columbia University and three years later established himself in New York City as a consulting engineer. He was chief engineer, in charge of subway construction, of the Rapid Transit Commission, New York City, in 1894-1904, and in 1898-99 made a survey of the railroads of China. In 1905 Parsons served on the Panama Canal board of consulting engineers, and in 1905-14 was chief engineer of the Cape Cod Canal. During American participation in the World War he served as major, lieutenant-colonel and colonel in the 11th U.S. Engineers, and was awarded the Distinguished Service Medal for "conspicuous distinguished service." He was also decorated by the British, French and Belgian governments. His published works include *An American Engineer in China*, 1900; *The American Engineers in France*, 1920, and *Robert Fulton and the Submarine*, 1923. Parsons died in New York City, May 9, 1932.

**PARSONS**, a city in Labette Co., southeastern Kansas, situated 30 mi. northeast of Coffeyville. Eight steam rail lines and one electric railway serve the city. Ryan Airport is municipally operated. Gas, oil and coal fields lie in the vicinity; shale pits are found near by. Parsons is a dairy and poultry market and a shipping center. It has also a shirt factory, packing and cold storage plants and a super-power plant. In 1929 the total industrial output was approximately \$6,000,000; the retail trade amounted to \$7,972,348. Parsons was settled in 1869 and chartered in 1871. Pop. 1920, 16,028; 1930, 14,903.

**PARSONS COLLEGE**, at Fairfield, Ia., a coeducational institution, named for its benefactor, Lewis B. Parsons, was organized in 1875. It is privately controlled and affiliated with the Presbyterian Church. The productive funds in 1931 totaled \$636,240. The library contained 18,000 volumes. The student enrollment in 1931-32 was 249, and the faculty of 29 was headed by Pres. Clarence W. Greene.

**PARSONS' CAUSE**, a controversy in colonial Virginia between the people and the established order, or the Established Church and the Crown. Tobacco, the keynote of the economic life of Virginia, was authorized tender for Church tithes. By an act of 1748, signed by George II, each minister of the Established Church in Virginia received an annual salary of 16,800 pounds of tobacco, and in 1755 the Virginia Assembly authorized the alternative payment of twopence for each pound of tobacco. In 1759 tobacco being worth sixpence per pound, the 65 orthodox clergymen complained, and the king in Council vetoed the provision for alternative payment. The clergy brought suits to recover the loss which they had suffered by the money payments. In the test case of the Rev. James Maury against the Fredericksville parish Patrick Henry appeared for the defendants, eloquently asserting the right of Virginia to make its own laws, and declaring that in annulling

a salutary ordinance at the request of a favored class "a king . . . degenerates into a tyrant, and forfeits all right to obedience." The court instructed the jury to decide for the minister; the jury assessed one penny damages against the parish. The clergy subsequently tried vainly to have Henry indicted for treason.

**PARTHENOGENESIS**, reproduction by unfertilized eggs. The mature egg, resembling those usually fertilized by the entering sperm, develops without that stimulus. Thus in certain rotifers, microscopic freshwater animals, females produce from parthenogenetic eggs a succession of female young when fed on colorless infusoria, but, fed on microorganisms containing chlorophyll, one becomes the grandmother of sons, i.e., the mother of male-producing daughters. The eggs of these daughters, if unfertilized, produce males; if fertilized, they pass the winter and become females.

Likewise, in the bee and some parasitic wasps, unfertilized eggs become males; but if fertilized, they become females, such as queens, or workers which are sterile females. Occasionally workers produce eggs, which parthenogenetically become males.

In plant lice, viviparous parthenogenetic reproduction of generations of females continues until conditions of light and temperature induce the production of a generation containing males. Thereupon, fertilized winter eggs are laid which, when spring comes, become parthenogenetic females. In some stick-insects males are rarely produced, development from parthenogenetic eggs being the almost universal rule.

Parthenogenesis in mammals is unknown, but the frog's egg, stimulated by the prick of a needle or by various chemical reagents, may develop parthenogenetically. The same is true of the eggs of the starfish, sea urchin and many other marine invertebrates.

J. H. G.

**PARTHENON** (literally, temple of the virgin), the great temple of Athena Parthenos on the ACROPOLIS of Athens. It was begun under the administration of Pericles in 447 B.C. and dedicated in 438. The architects were Ictinus and Callicrates, but the entire work was under the superintendence of PHIDIAS. For the purity of its Doric style, for the extreme subtlety of its architectural refinements, and for the high quality of its decoration, it has been considered an unrivaled work of art by both the ancient and modern world. It is particularly celebrated for its sculptures, many of them by the hand of Phidias: the great chryselephantine statue of Athena in the cella, the groups in the tympani of the two pediments, the metopes in high relief, and the continuous frieze in low relief around the outside wall of the cella. See also GREEK ARCHITECTURE.

**PARTHENOPEAN REPUBLIC, THE**, was established on Jan. 23, 1799 after the flight of the ruling Bourbon family from Naples to Sicily. The antecedents of this action were the opening of the Neapolitan port to the British and the attempt and failure of the Neapolitan army to defeat the French in the territory of the Roman Republic. The existence of

the new republic was short-lived, for the French defeats in Italy during the War of the Second Coalition forced the French troops to withdraw from Naples some months later. The Bourbon King returned to Naples and organized a reign of vengeance and terror largely in retaliation for the exactions practiced by the French Commissioners.

**PARTHIA**, an ancient Asiatic kingdom and empire which grew out of a Persian province. Its people, of Turanian stock like the Huns and Turks, were conquered by CYRUS THE GREAT and incorporated, 6th century B.C., within the Persian Empire. After Alexander's conquest of Persia, Parthia became a province of the Seleucid Empire (Syria); but when the Bactrians, a neighboring people, successfully revolted against Antiochus Theus, one Arsaces led the Parthians to independence, 255 B.C. All Parthian rulers took his name, and the dynasty is called Arsacid. Arsaces Mithridates I (174-136 B.C.) extended the territory west to the lower Euphrates, thus creating the Parthian Empire, which was administered after the ancient Assyrian plan of petty kingdoms subordinate to a king of kings, rather than the Persian model of satrapies. The king was elected by a council of lords, but was necessarily of the Arsacid family.

The empire was always warlike, but despite a superficial veneer and the founding of several great cities, notably Ctesiphon, later capital of the Sassanid Persians, never culturally or commercially important. In the 1st century B.C., while Rome was fighting Mithridates of Pontus, Parthia was her ally and, at the successful termination of the war, became a neighbor of the Roman Empire. A protracted struggle between them followed for three centuries, during which neither gained. The mode of fighting peculiar to the Parthians, an arrow volley while in pretended retreat, inspired respect in the Romans, who considered them the most warlike of their enemies. TRAJAN in 115 A.D. finally penetrated the country and took most of the cities; but they could not be held, and HADRIAN withdrew to the old boundary of the Euphrates. Under the 30th Arsaces, 226, a son of Sassan led the Persian subjects in revolt, abruptly terminated Parthian rule, and founded the Sassanid Dynasty of Persia.

**PARTHIAN** or **PAHLAVIK**, an extinct Middle Iranian language of the INDO-IRANIAN branch of the INDO-EUROPEAN linguistic family. It is essentially the northern dialect of PAHLAVI used by the Arsakids, and known only from a fairly large number of inscriptions. It is linguistically important as being the main source from which ARMENIAN borrowed its older Iranian LOAN-WORDS.

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**PARTICULARS, BILL OF**. See **BILL OF PARTICULARS**.

**PARTIE ROUGE, LA**, in Canadian political history, an ardently radical faction which took shape in 1847 when LOUIS JOSEPH PAPINEAU returned to Canada. Asserting many demands of the CLEAR GRITS, this faction in Lower Canada, practically a French-Canadian party, further advocated the repeal of the

Union act and the establishment of a republic. Papineau stated its object as "the independence of Canada, for the Canadians need never expect justice from England, and to submit to her would be a national disgrace."

**PARTING METALS**. The sawing of metals, developed mostly during the past 20 years, may be divided into two classes, one using thick saws and the other thin saws. In the former class are the "cold," or cutting off, saws which are circular and similar in appearance to those used for wood. The operation is the same except as to speeds and feeds. With some of the large cutting off saws having inserted teeth, each tooth takes a fairly heavy chip.

Hand operated Hack Saws were the first of the thin saw class to be used. The next step was a power driven hack saw which used a similar blade, though of course somewhat longer and thicker to take the added strain and to permit a longer stroke. Metal Band Saws are being used increasingly, both for plain cutting off work and for making odd shapes in metal and in tool room work. On costly metals, the saving in materials by the use of the thinner saw is a factor that must be considered.

Hot saws, or circular saws without teeth, are used to some extent in the steel industries. The frictional heat produced by the saw running rapidly against the work melts the metal. This type is sometimes called a *friction* saw. Thin abrasive wheels made with an elastic bond are also frequently used in cutting metals. See also **GRINDING WHEELS**.

Sheet metal may be cut by **SHEARING** or **slitting**, the latter being usually confined to cutting the sheets into narrow strips. Shearing machines are part of the equipment for working or cutting sheet metal and plates.

F. H. C.

**PARTINGTON, MRS.**, in the *Life and Sayings of Mrs. Partington*, 1854, by the American humorist, B. P. Shillaber, a highly ridiculous old lady who is famous, like Sheridan's Mrs. MALAPROP, for her blundering use of words and phrases. See also **SHILLABER, BENJAMIN**.

**PARTITION**, in law, a division of property among company owners, so that thereafter each holds his share in severalty. If personal property held in co-ownership is divisible in kind, any co-owner may partition by taking his share. If not, recourse may be had to equity to sell the property and divide the proceeds. In case of land there may be a voluntary partition by exchange of conveyances. At common law involuntary partition was possible only among co-partners. But equity would partition in other cases and statutes now govern the various aspects of the subject everywhere.

**PARTNERSHIP**, a relation based on contract or agreement between two or more individuals who, as co-owners, carry on a common business for profit. (Uniform Partnership Act, S. 6.) The law of partnership was developed in England mainly from principles laid down by Roman law. Prior to the passage of the Partnership Act of 1890, this law existed as a



branch of the COMMON LAW. United States' law of partnership conforms in general with English common law, although some states regard a partnership as an entity distinct from the partners rather than an aggregate of individuals. A Uniform Partnership Act, effective in 1915, which has been adopted in a number of states, is largely a codification of the common law. It restricts neither the number of persons in a partnership nor the type of business in which they engage, except as such limitations may be imposed by other legislation.

A co-partnership differs from a CORPORATION, another common type of business association, in the relative ease with which it may be formed or dissolved, and in the personal liability of the individual partners for partnership debts. Some causes for dissolution of a partnership are death of any partner, bankruptcy of any partner or the firm, lunacy of any partner, impossibility of carrying on business except at a loss, termination of the period specified in the agreement, and notice of withdrawal by any partner if the partnership is at will, i.e., not for a definite term or particular undertaking.

Whereas a shareholder of a corporation is not ordinarily liable for the corporation's obligations, the creditors of a partnership may satisfy their claims from the individual property of the partners where partnership assets are insufficient for the payment of such obligations. Contrary to English law a person admitted to a partnership becomes liable in general for obligations incurred before his membership was acquired.

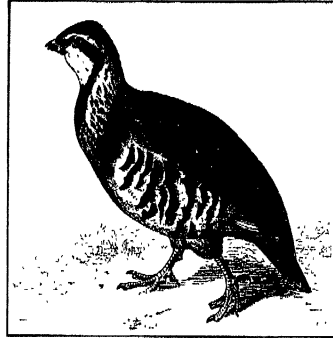
**Limited Partnership.** In 1822, New York adopted the first statute permitting limited partnerships and allowing individuals to contribute a certain sum of money to a firm's capital, limiting their liability for losses to a sum equal to the amount contributed. This form of partnership was adapted directly from the French *Code de Commerce* and had no counterpart in England until the Limited Partnership Act of 1907. By the Uniform Limited Partnership Act (1916) the limited partner assumes the character of an investor. He has no share in the management of the business, which is conducted by at least one general partner whose liability is unlimited. The statute provides for the registration of limited partnerships with complete details as to their organization. Without such registration and publicity, the limited partnership is in fact an ordinary partnership and the special or limited partner is liable for the total of the firm's indebtedness.

C. F. WE.

**PARTRIDGE, WILLIAM ORDWAY** (1861-1930), American sculptor and author, was born in Paris, France, Apr. 11, 1861. He studied modeling in Paris, Florence and Rome. His well-characterized portrait busts first brought him fame, and he also became known as a lecturer and writer on art and letters. His sculptures include the statue of Hamilton in Brooklyn; Shakespeare, Lincoln Park, Chicago; equestrian statue of Gen. Grant, Brooklyn; *Pocahontas*, at Jamestown; *Madonna* and *Christ and St.*

*John*, Brooklyn Museum; and busts of Whittier, Tennyson, Burns and Longfellow. His publications include: *Art for America*, 1894; *The Technique of Sculpture*, new ed. 1906; *The Angel of Clay*, 1900, and *The Czar's Gift*, 1906. Partridge died at New York City, May 22, 1930.

**PARTRIDGE**, a common name given to any small gallinaceous bird intermediate in size between the quails and the grouse and most often to members of the family *Perdidae*, as the Hungarian or gray partridge of Europe, the French or red-legged par-



RED-LEGGED PARTRIDGE

tridge, the California partridge or QUAIL and the Massena partridge. In New York and New England the ruffed grouse is called partridge, further south the name is applied to the bobwhite. There is no technical restriction to the use of the name.

Partridge shooting offers one of the finest kinds of shooting. The methods used in different places vary as much as the birds. In Europe and England, as with other game birds, it is usual for beaters to drive the partridge to where the guns are waiting. American partridge, hunted over dogs, include ruffed grouse and pinnated grouse, or sage hen, now nearly extinct. The ruffed grouse have their home in the woods and are particularly fond of high, sloping, rocky hills dotted by pines, hemlocks and evergreens. They prefer the deepest woods and thickets and frequent low ravines. They are very shy and frequently run ahead of the dogs, then rise far out of range. Most hunters consider them the most cunning of North American birds. The best load for partridge is 3½ drams of smokeless powder, and 1½ ounces of No. 4 or 5 shot. See Frank Schley, *American Partridge and Pheasant Shooting*, 1877.

**PARTRIDGE BERRY** (*Mitchella repens*), a small creeping evergreen herb of the madder family called also twinberry. It grows in moist woods from Nova Scotia to Minnesota and southward to Florida and Texas, ascending to an altitude of 5,000 ft. in Virginia. The smooth, slender, trailing stems, about a foot long, bear roundish, dark green shining leaves and at the summit a pair of sessile white flowers. The red berry-like fruit (drupe), which persists through the winter, is edible. Various other small plants with persistent fruits furnishing winter food



for game birds are called partridge berry, as the wintergreen (*Gaultheria procumbens*) and bunchberry (*Cornus canadensis*).

**PARTS OF SPEECH**, the various categories in which words are classified. As conventionally given in English grammars, they are articles, nouns, pronouns, adjectives, verbs, adverbs, prepositions, conjunctions and interjections—an arrangement the reverse of scientific. Much confusion has arisen from confounding their use with their origin and historical development; i.e., the psychology of SEMANTICS has been mixed with the physiology of INFLECTION.

From the scientific point of view, the classification must be strictly morphological. First of all, the interjection must be excluded; it is either a mere reflex of emotion ("ouch!"), an elliptical sentence ("good Lord! = good Lord, deliver us!"), or, as in the vocative of the noun and the imperative of the verb, a mere base-form (Latin *serve* "slave!", *dic* "say!"; see CASE; MOOD). For all the rest, one must proceed from the BASE, thus giving three categories: noun, verb and pronoun. The first two are usually traceable to the same base, as Latin *can-tor*, "singer" *can-o*, "I sing." A noun may be defined as a word inflected by terminations of CASE; a verb, as one inflected for person (see PERSONAL ENDINGS), tense and mood; number and, in many languages, gender are indicated in both. Between the noun and the adjective there is no essential difference, thus *bruin*, originally an adjective, is now a noun. The adverb is primarily a stereotyped case of an adjective or noun, as French *aimable-ment*, "aimably" = VULGAR LATIN *amabile mente*, "with kindly mind." Prepositions and conjunctions are stereotyped adverbs, as English "see through a thing: see a thing through;" Latin *et*, "and," originally a locative singular of a noun (cf. SANSKRIT *āti*, "beyond"). There is also reason to believe that the verb is later in development than the noun, since the former is frequently ENCLITIC, and while verbless sentences are possible, no true sentence can exist without a noun (see COPULA).

The definite article is simply a demonstrative pronoun (cf. French *la femme*, "the woman" = Vulgar Latin *illa femina*, "that woman"), just as the indefinite is merely a numeral adjective (French *une femme* = Latin *una femina*, "one woman"; cf. German *eine frau*). As regards the pronoun, whose inflection frequently differs from that of the noun, it is possible that originally there were two nominal categories: one from bases connoting general action or state, and so capable of development into either nouns or verbs; the other form bases connoting only specific beings or things, and so evolving only into pronouns. If this be true, all parts of speech came ultimately from the single category of nouns.

The infinitive is a stereotyped case of a noun denoting action, as is the Latin "supine" (e.g., *dicere* is an old locative, *dictum* an old accusative, and *dictu* an old "ablative" = an original instrumental); the participle is an adjective denoting action; and the numerals were originally partly nouns and partly adjectives,

they, like the pronouns, being derived from bases whose meanings seem peculiar to them alone.

L. H. G.

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**PARTY PLATFORM**, a statement of principles and policies of political parties in the United States in advance of the campaign and election. With the rise of the state and national nominating conventions a hundred years ago the practice became firmly established. A committee on resolutions drafts the document and submits it to the convention (see CONVENTION, POLITICAL) for approval. This step is taken almost invariably before the candidates are nominated, the implication being that the creed of the party has greater significance than the standard-bearer. Latterly, however, the people have shown more interest in the pronouncements of the presidential or gubernatorial candidate than in the platform; for he is less likely to take refuge in obscure, ambiguous phrases, and, unlike the convention, can be held to account for what he promises. In a dozen states where the convention has been swept away, the making of the platform has been entrusted to a party council, a more responsible body consisting usually of party candidates for state and legislative office. Party manifestoes in Europe proceed sometimes from a party congress, sometimes from a party leader or committee.

E. M. S.

**PARTY WALL**, a wall partly on the land of one adjoining owner and partly on that of the other for the benefit of both. It may be owned by the two as owners in common, or may belong entirely to one subject to an easement in the other, or each may own the part in his land with cross easements whereby each may use the whole and neither can deprive the other's moiety of the necessary support.

**PASADENA**, a city of southern California, immediately adjoining the city of Los Angeles on the northeast. It is served by the Santa Fe, Union Pacific and Southern Pacific railways and interurban electric lines. The city is about 5 mi. from the Sierra Madre range, and nearby are peaks ranging in height from 3,200 to 6,000 ft., among them Mt. Lowe, Mt. Wilson and Echo Mountain, on which is located the Lowe observatory. Citrus ranching is carried on in the vicinity. The manufactures include flour mill, cannery and packing-house products. In 1929 the factory output reached approximately \$7,000,000; the retail trade amounted to \$59,883,121.

Pasadena is primarily a residential city, with many beautiful homes and semi-tropical gardens. It is the seat of the CALIFORNIA INSTITUTE OF TECHNOLOGY and has a public library with four branches and three public museums. The famous Rose Bowl Stadium, accommodating 80,000, is located here, and an annual Tournament of Roses is held annually on New Year's Day. In San Marino, a suburb to the south, is the Henry E. Huntington Library and Art Gallery. On Mt. Wilson is situated the Solar Observatory of the Carnegie Institution, one of the best equipped

observatories in the world. The settlement was established by Spaniards in 1771. In 1874 colonists from Indiana took up fruit-ranching there, and in 1886 Pasadena was granted a city charter. Pop. 1920 45,354; 1930, 76,086.

**PASCAGOULA**, a city in southeastern Mississippi, the county seat of Jackson Co., situated on the Pascagoula River and the Gulf of Mexico, 40 mi. southwest of Mobile, Ala.; served by bus lines and two railroads. Pascagoula is a shipping point for fish, oysters and farm produce, and has paper mills. It is a tourist center, and for a time was the home of HENRY W. LONGFELLOW. Pop. 1920, 6,082; 1930, 4,339.

**PASCAL, BLAISE** (1623-62), French philosopher and mathematician, was born at Clermont Ferrand, Auvergne, June 19, 1623. As a child he showed himself a prodigy of erudition and industry. In 1647 he published *Nouvelles expériences sur le vide*, proving himself an eminent mathematician even in an age of mathematicians. But his health was undermined by constant application to study and he was advised to seek relaxation in society, his family having settled in Paris some years before. Accordingly, until 1654 he led the life of a young man of means, although without the profligacy usually associated with that age. At that date Pascal experienced a religious conversion, and he withdrew from society, his life thenceforth being characterized by extreme austerity and simplicity. In 1656 he was invited to write a defense of Antoine Arnauld, the Jansenist, who had been accused of heresy by the Sorbonne. He accepted this invitation, and the first of his famous *Provincial Letters* appeared in 1656. It was widely read, and Pascal followed it with seventeen additional *Letters*. His religious and philosophical ideas, expressed in the *Provincial Letters* and in his *Pensées*, have long been a subject of controversy, many considering his attitude enigmatic, although the charm and vigor of his literary style are conceded. Pascal died at Paris, Aug. 19, 1662.

**PASCAL'S THEOREM**, an important theorem discovered by BLAISE PASCAL (1623-62). It states that if a hexagon be inscribed in any conic section, the points determined by the three pairs of opposite lines, or sides, determine a single, or straight, line. Interchanging *points* and *lines* for *lines* and *points*, by the principle of DUALITY, this gives rise to BRIANCHON'S THEOREM. See HEXAGRAM, MYSTIC.

Power	Coefficients												
1	1	1											
2	1	2	1										
3	1	3	3	1									
4	1	4	6	4	1								
5	1	5	10	10	5	1							
6	1	6	15	20	15	6	1						
7	1	7	21	35	35	21	7	1					
8	1	8	28	56	70	56	28	8	1				
9	1	9	36	84	126	126	84	36	9	1			
10	1	10	45	120	210	252	210	120	45	10	1		
11	1	11	55	165	330	462	462	330	165	55	11	1	
12	1	12	66	220	495	792	924	792	495	220	66	12	1 etc.

**PASCAL'S TRIANGLE**, a table of coefficients for the BINOMIAL EXPANSION. It was first described in the *Arithmetica Integra* of Stifel (1544) in connection with extraction of roots, although it was known much earlier. In 1654 it was extensively studied by Pascal, whose name it bears. Thus in the expansion of  $(a+b)^1$ ,  $(a+b)^2$ ,  $(a+b)^3$ , . . .  $(a+b)^{12}$ , the coefficients can be found by the preceding table, the method of making which is easily seen.

**PASCHAL**, the name of two popes and two antipopes. St. Paschal I, 817-824, crowned Lothair I co-emperor and appointed Archbishop Ebo of Reims as vicar for missions in the northern countries. Pope Paschal II, 1099-1118, was of the same temper as Gregory VII, but without his energy. He was captured in St. Peter's and forced to crown Emperor Henry V, but later repudiated his compact with Henry as made under compulsion. Paschal III, 1164-68, was enthroned as Pope by the party of Emperor Frederick Barbarossa as antipope to Alexander III. The antipope in 687 was also called Paschal.

**PASCOLI, GIOVANNI** (1855-1912), Italian poet, was born at San Mauro di Romagna, Dec. 31, 1855, and educated at the University of Bologna. Following his imprisonment for "subversive propaganda," he took to teaching and writing. *Myricae*, 1891, his first volume of verse, was followed by *Primi Poemetti*, *Nuovi Poemetti*, *Poemi Conviviali* and others. As with GIACOMO LEOPARDI, a strain of cosmic mysticism runs through his poems. After Carducci's death, 1907, Pascoli was generally recognized as Italy's national poet. He died at Bologna, Apr. 6, 1912.

**PASHITCH, NICOLAI** (1846-1926), Serbian statesman, was born on Jan. 1, 1846. He became a radical early in his political life, founding the Radical Party in 1881, and leading an uprising that forced him into exile. In 1889 the sentence of death which had been pronounced against him was revoked. He returned to Belgrade, and soon became mayor of the city and president of the Skuptina. During 1893-94, he was ambassador to Russia, becoming an ardent Pan-Slavist. In 1899 he took part in an unsuccessful attempt upon the life of King Milan, was arrested and sentenced to five years' imprisonment but pardoned upon the intercession of Russia. He again entered politics, was elected to the Skuptina, and from 1904-14 was four times president of the ministry, holding that office for the fifth time during the Balkan War and World War. It was Pashitch therefore who directed Serbia's policy during the fateful days, not only of June and July 1914, but during the World War itself. At the Paris Peace Conference, he represented the southern Slav, and in 1921 he became prime minister of Yugoslavia, working to the utmost of his ability for a strong central Government. During the summer of 1924 he resigned, but returned to the premiership in the autumn, occupying the office at the time of his death in 1926.

**PASQUE FLOWER** (*Anemone Pulsatilla*), a low, silky-hairy, early blooming WINDFLOWER common in

woodlands throughout Europe and northwestern Asia and sparingly cultivated as a spring ornamental. It is an almost stemless plant bearing numerous finely divided basal leaves and beautiful bell-shaped violet-purple flowers produced singly on slender stalks. The fruit is a dense head of achenes with long silky tails. The American PASQUE FLOWER (*A. patens*), a very similar plant with more finely dissected leaves, is a characteristic early spring wild flower in dry prairies from Illinois to British Columbia and southward to Texas. This very attractive plant, called also wild cornus and mayflower, has been adopted as the floral emblem of South Dakota.

**PASQUINADE**, a political squib or SATIRE. Among the citizens of Rome in the 15th century it was a practice to attach certain epigrammatic verses, tersely expressing their political and religious grievances, to the base of an ancient statue near the Piazza Navona. This statue was popularly called *Pasquino* because it stood opposite the house of a tailor of that name.

**PASSACAGLIA**. Italian dance in triple meter and stately tempo, similar in character to the chaconne, being constructed over a basso ostinato or ground bass. A short phrase in the bass is repeated many times while various harmonies are erected upon it. The finest extant example of this form is J. S. BACH's *C-minor Passacaglia* for the organ.

**PASSAIC**, a city of Passaic Co., N.J., located on the Passaic River, 10 mi. northwest of the New Jersey terminus of the Holland tunnel and 4 mi. south of Paterson. Its transportation facilities include the Lackawanna, Erie and Susquehanna railroads, trolleys and motor-bus lines. The city has long been an important manufacturing center of the country. In 1929 its factory products were valued approximately at \$89,000,000; the retail trade reached a total of \$32,601,645. Its many and diversified industries include the manufacturing of woollens, worsted and cotton goods, silks, metal, shatter-proof glass and handkerchiefs, and bleaching and dyeing. Passaic was settled by the Dutch in 1679 and originally called Acquackanonk. It was chartered as a city in 1873. Pop. 1920, 63,841; 1930, 62,959.

**PASSAIC RIVER**, a stream of northern New Jersey, rising in Morris Co. The first part of its course flows northward, forming the boundary between Union and Essex counties on the right and Morris Co. on the left. Then it turns east to Paterson, from which point it flows south and enters Newark Bay 3 mi. below Newark. This river is nearly 100 mi. long but the distance in a straight line from its source to its mouth is only 15 mi. It has a fall of over 240 ft., 70 ft. of which is at Paterson where there is a cataract having a vertical height of 50 ft., which affords immense water power. The important cities on its course are Paterson, Passaic and Newark.

**PASSAMAQUODDY**, a North American Indian tribe, a member of the ABNAKI confederacy, and speaking a language of the Algonkian stock dialectically similar to the Malecite. Their territory formerly

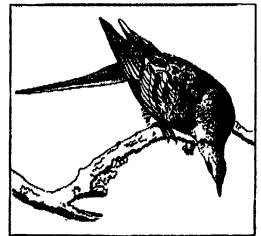
comprised all the region around Passamaquoddy Bay, the St. Croix River and Schoodic Lake in Maine and New Brunswick. Their principal village was Gunasquamekook on the site of St. Andrews, N.B. Since 1866 the Passamaquoddy have been settled on the south side of the Bay at Sebaik and on Lewis Island.

**PASSENGER CAR.** See RAILROAD ROLLING STOCK.

**PASSENGER CASES**, 1849, a notable series of litigation before the United States Supreme Court involving the power of state legislatures over commerce. "Smith vs. Turner" questioned the constitutionality of the New York State statute empowering the health commissioner to collect a fee for every passenger and hand on ships entering the Port of New York, the fund to be used for the maintenance of the marine hospital at Staten Island. "Norris vs. Boston" questioned the constitutionality of a Massachusetts statute demanding that shipmasters pay \$2 for every alien passenger landed, the fund to be used for the support of foreign paupers. Both cases were argued together, by distinguished counsel including Daniel Webster, John Van Buren and Rufus Choate. On Feb. 7, 1849, both laws were declared unconstitutional, each of the judges reading an opinion. Justices McLean and Wayne held that Congress' power over such commerce was exclusive; Catron, Grier and McKinley held that the laws were unconstitutional because of conflicting Federal legislation. Chief Justice Taney and Justices Nelson, Daniel and Woodbury dissented either on the ground that no conflict existed or that regulation of passengers was not regulation of commerce. The case had broader significance in that southern statesmen feared that the exclusive control of the Federal Government over interstate and foreign commerce threatened slavery; States-rights advocates regarded the decision as disastrous.

**PASSENGER PIGEON.** The wild pigeon of North America (*Ectopistes migratorius*) resembled the common mourning dove but was larger and more richly colored, being bluer on the upper parts and redder on the breast. It spent the winter in the southern states from Florida to Arkansas and nested in large colonies from New York to western Mackenzie, the location of these colonies depending on the available food supply of acorns and beechnuts. On migration they traveled in enormous flocks.

In 1808 A. Wilson estimated a flock near Frankfort, Ky., at 2,230 million birds. They flew at a great height, in a vast column thought to be 150 miles long. When resting they covered forest tracks 40 or more miles square, 100 or more nests to a tree. Branches broke under their weight, killing numbers of birds. They devastated crops; their cooing drowned the report of guns; and southern and midwestern



PASSENGER PIGEON

settlers of the early 19th century hunted them as pests, with firearms, poles and burning sulphur. The rapid disappearance of the passenger pigeon cannot be ascribed entirely to hunting, for they had two or three broods a year, averaging two eggs to a nest. It is believed that pest or disease accounts for their final extermination. The last known specimen died in the Cincinnati Zoological Gardens in 1914.

G. E. F.

**PASSION FLOWER** (*Passiflora*), a numerous genus of mostly climbing herbaceous or woody plants comprising the major portion of the passion flower family. There are about 300 species, natives almost exclusively of tropical and subtropical America. The stems bear numerous tendrils, entire or digitately lobed leaves, large, mostly axillary flowers of striking appearance, and succulent, berry-like, often edible fruit. These singular and beautiful plants were called passion flower by early Spanish settlers on account of the supposed resemblance of the various parts of the flower to the implements of the crucifixion.



PASSION FLOWER OR MAYPOP

The numerous filaments of the corona were fancied to represent the crown of thorns; the three prominent styles, the nails of the cross, two for the hands and one for the feet; and the five anthers suggested the marks of the wounds. Various tropical species yield delicious fruits as the granadillas, the water-lemon and the sweet calabash; many others are grown in warm climates for their highly ornamental flowers. The MAYPOP (*P. incarnata*) is widely distributed in the southern United States. See GRANADILLA.

**PASSIONISTS**, members of the Congregation of Discalced Clerks of the Most Holy Cross and Passion of Our Lord Jesus Christ, a mendicant order in the Roman Catholic Church. The first community, established by St. Paul of the Cross about 1737, was a hermitage on Monte Argentario in Tuscany. In 1720 the founder had written the Rules and Constitutions which were approved by Benedict XIV 21 years later. Clement XIV gave the Passionists the Church and Monastery of Sts. John and Paul on the Caelian Hill, Rome, as a mother-house. The aim of the Passionists is to sanctify first themselves by the contemplative life, then others by missionary work in the parishes of non-Catholic countries and in the foreign mission field. They make a special vow to spread devotion to the Passion of Jesus Christ. The Scala Santa in Rome is under their supervision. Members of the congregation number about 3,500, of which more than 1,000 are priests. They are most numerous in the British Isles and the United States, although theirs is a world-wide institution comprising 115 houses.

**PASSIVITY**, in chemistry, the inactive state acquired by some metals. It is produced by the action of strong oxidizing solutions, such as concentrated nitric acid or chromates, or by making the metal anode in an electrolyte. Passive metal is more cathodic, and more resistant to corrosion under some conditions. It soon reverts to the normal condition when removed from the passivating media, especially when abraded, heated, or in contact with chlorides.

Passivity is probably due to an invisible oxide film on the metal surface. This film has actually been separated by Evans.

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**PASSOVER** (Hebrew, *Pesach*), the name of the Jewish festival which falls on the 14th day of the Hebrew month Nisan, March-April, and lasts for eight days (among Reform Jews, seven). It is called also the Festival of Unleavened Bread, because during the duration of the festival, no ordinary or leavened bread is eaten, but instead unleavened bread (Matzoth) (cf. Leviticus 23:4-8; Exodus 12:1-20). It serves as a reminder of the haste wherewith their deliverance and escape from Egypt took place.

Passover commemorates the deliverance of the Hebrews from their slavery in Egypt during the days of Moses. But originally it was the sole festival of the religion of the nomadic, shepherd people Israel. Later, after the entrance of the Israelites into the land of Canaan, it became also an agricultural festival, and it was one of the three pilgrimage festivals; the Matzoth cakes represented offerings made to the Deity from the new grain harvests. Still later, in the days when agriculture and pastoral pursuits lost their significance, Passover was given a new motif, the historical one, the time of the Exodus of the Hebrews from Egypt and the consequent birth of the Hebrew nation.

A. SH.

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**PASSPORT**, a document permitting persons to leave one country and enter another. In the United States this privilege is obtained for a citizen by an application to the Department of State, a form being duly filled out and sworn to. The applicant is required to state where and when he was born, also the residence of his parents. A woman also gives the residence of her husband. If a wife and children are to be included, they are specifically named. If a person is a naturalized citizen, the proper proof must be presented. A photograph and description of the person is inserted in the passport and the time of absence stated. Five dollars covers the fees. In other countries the requirements for obtaining passports vary only in detail, the general requirements being practically the same. An Englishman makes his application in London to the Passport Office and goes through practically the same investigation required in the United States. Should he be going to France,

however, for not more than fourteen days, a passport is not required. In France, Spain and Germany the requirements for obtaining a passport are very similar to those in the United States. A citizen of any of these countries proves his citizenship by his birth certificate, if obtainable, otherwise a parent or some close friend is allowed to prove the applicant a citizen. Where a naturalized citizen applies, his naturalization papers must be produced.

As regards emigration from other countries to the United States, let us take, for example, the procedure followed in Italy. A person desiring to emigrate to the United States applies to the United States Consul, who, if all representations as to the applicant's means, health, and character are satisfactory, visas the application, which is then taken to the Italian department of emigration. This is the rule in practically all countries. Where the emigration from certain countries is limited in numbers, the passport is not issued where the quota of the applicant's country has already been filled. Should the passport, however, be issued, the emigrant will not be permitted to land if the quota proves to be filled.

**PASSY, FRÉDÉRIC** (1822-1912), French publicist and economist, was born at Paris in 1822, and educated for the law. His first book, *Mélanges Economiques*, appeared in 1857. Beginning in 1867 he devoted himself to the cause of international peace, founding the *Ligue Internationale de la Paix* in that year. He was elected a member of the Académie des Sciences Morales in 1877, and after the establishment of the Third Republic sat in the Chamber of Deputies. With the Swiss philanthropist Henri Dunant, Passy in 1901 was awarded the first Nobel Peace prize. He died at Paris, June 12, 1912.

**PASTEL**, an art of painting with ground pigments held together with the smallest possible amount of gum water to form a pencil or crayon so that a dry velvety outline of high color tone may be applied to a flat surface. The methods in commonest use are: the superimposition of thin lines on a rubbed or smeared-in background; the adding of layer after layer of pressed-on strokes, all being blended into imperceptible gradations; the placing of crisp touches side by side, allowing the surface of the paper to show through and form part of the design. The use of colored earths is of primitive origin, but in Europe the earliest preserved colored drawings in this medium are those of Guido Reni (1575-1642). The Venetian Rosalba Carriera was among the artists in the early 18th century who brought the art to perfection; it was a medium adapted to her genius, and she made it the fashion of Europe. Pastel has its own distinctive qualities of luminosity and brilliance, and gives a delicate bloom which imparts an elusive freshness and depth to its tones. For these reasons portrait artists have ever been quick to recognize it as a medium for expressing their individual genius. Pastel cannot be made to imitate oil painting without altering its distinctive qualities, and it does not lend itself to large surfaces or classic compositions. It is essentially the

art of the colorist and is adapted to the depiction of fugitive atmospheric landscape effects. It has the quality of bringing out texture and produces pleasing effects in still life.

**PASTERNAK, BORIS** (1890- ), Russian lyric poet, was born in Moscow, Jan. 29, 1890, son of a celebrated painter. His book of lyrics entitled *My Sister Life*, 1917, introduced him as a poet's poet, a reputation confirmed by *Themes and Variations*, 1923. Although to a certain extent a follower of the so-called Futurist School of poetry, his quaint metaphysical conceits, in the style of JOHN DONNE, entitle Pasternak to his rating as founder of a new school of poetry.

**PASTES, ALIMENTARY**, are made by doughing middlings, SEMOLINA, or flour, forming into the desired shape and drying.

Macaroni is made from semolina, hard-wheat middlings, or wheat-flour dough, and formed into tubes by pressing through a die. The best, made from semolina, is creamy in color, unevenly translucent, and does not become sticky when boiled. The poorest is made from flour. Spaghetti is like macaroni, but of lesser diameter; vermicelli, also like macaroni, is of still smaller diameter.

Noodles are made by doughing flour with eggs, rolling into sheets, and cutting into the desired shape, usually ribbons. If not for immediate use, they are dried. Commercially, they are usually made with dried egg yolks and water, instead of whole eggs. An inferior grade (water noodles) is made from flour and water alone.

Fish pastes are made by grinding fish, freed from bones, to a paste with or without spices, vinegar, and other condiments. If the fish are not salt-cured, salt is added for a preservative. The most important product is made from anchovies.

Meat pastes are made by mincing meat to a paste, seasoning, and preserving in cans or jars.

Fruit pastes (fruit butters) are made up by pulping fruit, removing seeds, cores and stems, and boiling down to a semi-solid consistency with or without the addition of sugar, spices, or vinegar. C. L. A.

**PASTEUR, LOUIS** (1822-95), French chemist, was born at Dole, Jura, Dec. 27, 1822. He completed his chemical studies at the École Normale, Paris, in 1847, was professor of physics at Dijon in 1848, and professor of chemistry at Strasbourg in 1849. In 1854 he became professor of chemistry and dean of the faculty of science at Lille, and in 1857, director of the physiological and chemical laboratory of the École des Hautes-Études, Paris. In 1863 he became professor of geology, physics and chemistry at the École des Beaux-Arts and in 1867, professor of chemistry at the Sorbonne. He became a member of the Academy of Medicine in 1873, and in 1889, member of the Institute Pasteur founded to carry on his work.

Pasteur made his first important discovery in 1848, the right and left light polarizing type of isomerism, a discovery which proved to be one of the

foundations of stereochemistry. His great fame, however, came from his discoveries in bacteriology. He early doubted spontaneous generation and was able to prove that all cases of putrefaction resulted from bacteria present in the air. In 1857 he made the discovery, in the course of studying the difficulties of the wine and beer makers, that all fermentation was connected with the presence of specific bacteria. In 1864 he established his conclusive proof of this and of his denial of spontaneous generation.

Concluding that human and animal diseases were the result of infections by various types of bacteria, he set out to find methods of fighting them. He developed the method of inoculation with a weak culture of a bacteria, inducing a mild attack of the disease and leaving the subject immune. Although this method failed to work in all cases, by it Pasteur succeeded in stamping out cattle anthrax, chicken cholera, succeeded in developing a cure for hydrophobia infection, and other diseases, and left to medicine a weapon of enormous value. The money value of his aid to the French wine and beer trade and his check upon the ruinous diseases of sheep and of the silkworm was enormous. Pasteurization, the method of rendering bacteria sterile by long exposure to heat and oxygen, was his invention. He died at Villeneuve l'Etang, near Paris, Sept. 28, 1895.

**PASTO**, a city of Colombia, and capital of the state of Nariño, situated at an elevation of 8,347 ft., about 35 mi. from Ecuador. The volcano Pasto rises 13,990 ft. above the city on the southwest. Its industries are the manufacture of woollens and pottery. The city was founded in the middle of the 16th century. In 1834 an earthquake caused the deaths of 10,000 people. Pop. 1928, 43,163.

**PASTOR, TONY (ANTONIO)** (1832-1908), American vaudeville actor and producer, was born at New York City in 1832. In 1846 he made his début at Barnum's Museum, New York City, and until 1860 he was a circus performer, appearing with marked success as a clown. In 1861 he opened a music hall at 444 Broadway, New York City, and in 1865, in partnership with Sam Sharpley, Pastor established the Volks Garden on the Bowery. In 1881 he obtained control of the Fourteenth Street Theatre, renamed Tony Pastor's Theatre, where he introduced "variety." His success in this field gave birth to modern American vaudeville. He died at Elmhurst, L.I., Aug. 26, 1908.

**PASTORAL**, a form of writing in verse or prose depicting the life of shepherds or other bucolic personages. The earliest pastoral poets of note among the Greeks were Theocritus, Bion and Moschus; and, among the Romans, Virgil and Horace. The pastoral was revived in Italy by Dante, Petrarch and Boccaccio, the last's *Ameto*, 1342, being noteworthy, as are also Politian's pastoral opera *Orfeo*, 1372, and Tasso's *Aminta*, 1573. In France besides the early *pastourelles* of Provence and the 16th century pastorals of the *Pléiade*, the outstanding production was Honoré d'Urfé's *Astrée*, 1610. Spain was favored with Jacopo

Sannazaro's *Arcadia*, 1504, and Jorge de Montemayor's *Diana*, 1524.

English literature, rich in pastorals, possesses Spenser's *SHEPHEARDES CALENDAR*, Sir Philip Sidney's *ARCADIA*, Thomas Lodge's *Rosalynde*, Drayton's *Shepherd's Garland*, Breton's *Passionate Shepherd*, Ben Jonson's *Sad Shepherd*, Shirley's *Arcadia* and Fanshawe's *Pastor Fido*, all of the 16th-17th centuries. Other poets whose pastorals still delight are Milton, Lovelace, Carew, Suckling, Herrick, Gay, Pope, Cowper, Burns, Allan Ramsay, Shelley and Tennyson. See also *INLY*; separate articles on the above authors.

**PASTURE**. The 1930 census reported 1,075,000,000 acres of pasture lands. This is approximately 56% of the total land area of the United States. But of this total acreage of pasture land fully three-fifths is in range land, leaving only about two-fifths on farms. Some 10% of this great pasture area is classed by the census as plowable land. This plowable pasture land represents an area greater than that devoted to any other one crop with the exception of corn.

Until recently pastures in the humid regions were for the most part on lands that were too rough, or poor in fertility to grow other crops. Great areas in the dry land regions that formerly were devoted to grazing are now cropped to small grains. On the other hand the newer knowledge of pasture values and pasture management is causing an increasing area of good cropping land in the humid regions to be laid down into permanent pastures or to grasses that will occupy a place in the crop rotation. Lands that are too wet for cropping are often devoted to pasture. The area of wet land pastures is increasing as a result of the discovery of suitable pasture plants for wet lands, notably reed-canary grass and Ladino clover. With the growing appreciation of the importance of good pastures in live stock production, the area of irrigated pastures is increasing not only on the irrigation projects but in many humid regions where water is available for irrigation.

Young grass in the leaf stage has a very high per cent of PROTEIN and a low per cent crude fiber. Grasses up to 3 and 4 weeks stage of growth have been found to have from 18 to 25% protein. As the grasses flower and go to seed, the proportion of stalk to leaf increases and the plants become less palatable as well as less digestible and nutritious. In order to secure the first results the pastures must be grazed heavy enough to prevent the grass from becoming too mature and yet not too close to injure plant growth. Plant growth must be maintained over as long a period of the growing season as possible.

In many regions seasonal conditions are such that grasses reach their maximum growth in the spring months and then have very little growth or are dormant till conditions for their growth become favorable again in the fall. If only a sufficient number of animals are carried to utilize the grass during that part of the pasture season of least growth, there will be too few to keep the growth down during the season of most rapid growth. Such being the case the

pastures should be divided so that a part can be mowed for hay during the period of most rapid growth. If a sufficient number of animals are carried to keep the grass grazed back to the proper stage of growth during the most favorable part of the growing season, then supplemental pasture or feeding must be available during the season of slowest growth. This is done by having special pastures, such as sweet clover, sudan grass or lespedeza so planted as to be available during the season of least growth in the permanent pasture; or by the cutting and feeding of soiling or catch crops such as rye, oats and peas, oats and vetch, millet, corn, sudan grass, and sweet clover. Many farmers depend on supplemental feeding of hay and silage during the periods of slow growth. Irrigation is a great aid in maintaining a more uniform growth of grasses throughout the pasture season. Fertilization plays an important part in promoting a better growth of pasture plants and also results in a more nutritious grass. Top dressing with manure (*see* FERTILIZERS) is an effective means of increasing the carrying capacity of pasture. Applications of lime and phosphorus results in a greatly increased growth in most regions. On some soils potash is needed. Nitrogenous fertilizers are being used to an increasing extent to stimulate the growth of grass.

The carrying capacity of pastures varies widely with the fertility of the soil, the amount and distribution of rainfall or water, the climatic condition that is favorable to plant growth, and the plants that are being pastured. In some parts of the dry land region 12 to 18 acres of pasture are required to support a cow or steer. On the other hand an experimental pasture at Huntley, Mont., that was under irrigation and had a heavy application of manure each year, had an average carrying capacity over a period of 9 years of 2.22 milk cows per acre throughout an average pasture season of 138 days.

The pasture mixture depends to a considerable extent on the region. In the Northern half of the United States blue grass and white clover have formed the common pasture mixture. In the Southern States, bermuda or carpet grass, white clover and lespedeza have perhaps been the most common mixture. In the humid regions of the Pacific Northwest perennial rye grass and white clover have been the common mixture. In many regions these grasses and clovers are supplemented by orchard grass, red top and timothy grasses and alsike and red clovers. In England the former practice was to have a great number of grasses and clovers in the mixture, on the theory that different grasses would come on at different periods of the pasture season and provide a succession of growth. But graziers in England now favor a more simple mixture which is made up in most parts of perennial rye grass, orchard grass, timothy and wild white clover. It is well to have the advice of the Agricultural College as to the grass and clover mixture that is best suited to any given locality. R. R. G.

**PATAGONIA**, the extreme southern portion of South America, comprising all of the Argentine south

of the Rio Negro and the adjoining Chilean territory, covering an area of approximately 235,000 sq. mi. The ANDES extend throughout western Patagonia and reach an extreme altitude of 13,000 ft. in Tierra del Fuego. The great Patagonian table-land in the interior extends in a series of shingled terraces from the Negro south to the base of the Andes. The east coast is flanked by precipitous cliffs; on the west the shore is bordered by island clusters. The inhabitants of this inhospitable and arid region are Alakalufs, Araucanians, Pehuenchos and other Indians. MAGELAN discovered Patagonia in 1520.

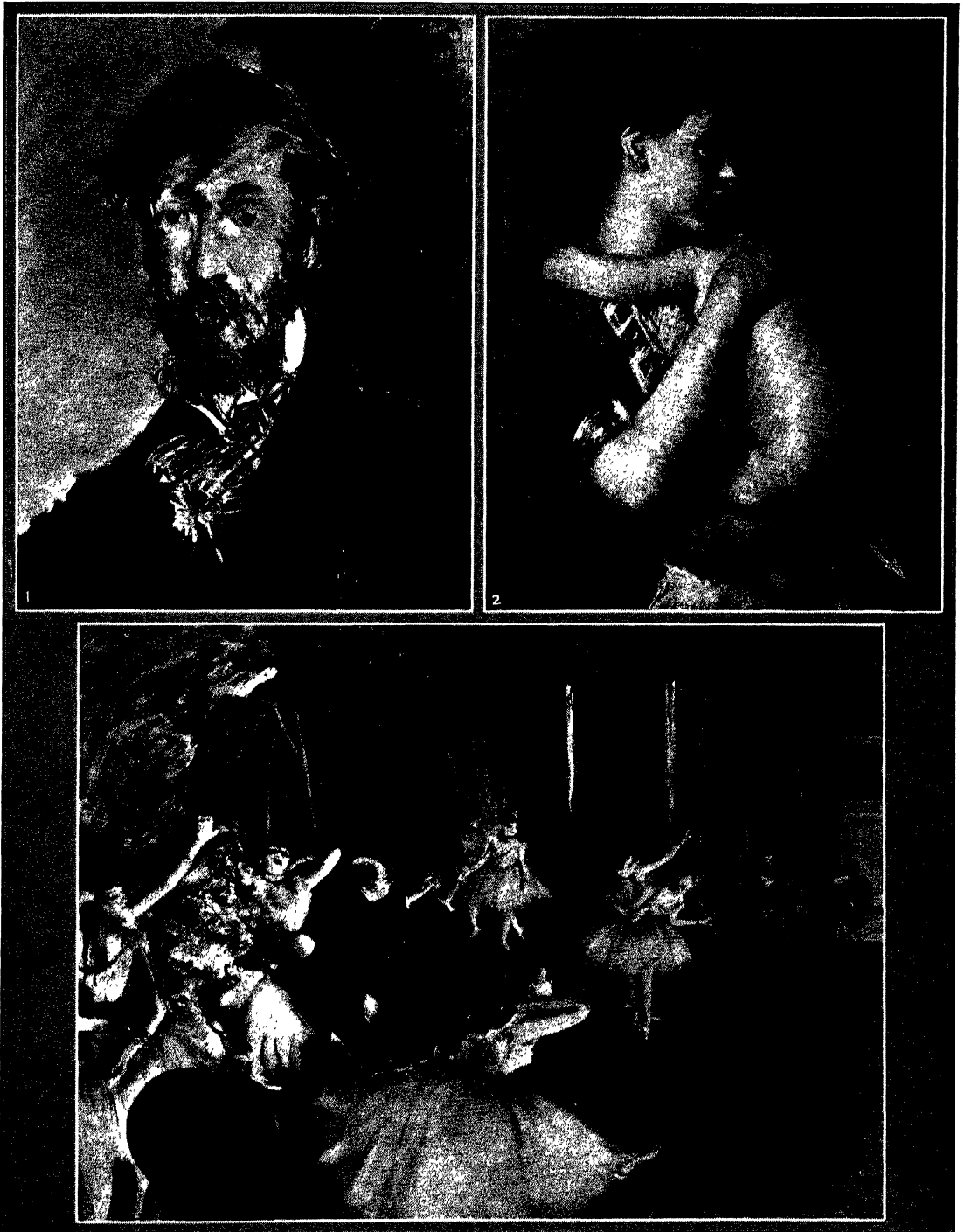
**PATAVIUM** or **PADOVA**, an ancient city of Venetia, built on the site now occupied by PADUA. It was located in the northern part of Italy about 30 mi. from the mouth of the Medoacus River. According to legend it was founded by the Trojan Antenor. During the Gallic wars it formed an alliance with Rome. Early important as a commercial center, it was later outrivalled by Aquileia, to which it lost much of its prestige. It was famous for the manufacture of woollens, and at one time the city boasted having 500 citizens worthy of equestrian rank. The city was sacked by ATTILA in 452 and about a century later by the Lombards.

**PATCHOGUE**, a village in Suffolk Co., on the south shore of Long Island, situated on Great South Bay, 50 mi. east of New York City. Patchogue is a shipping center in a fishing and farming region. The village has factories producing lace curtains, infants wear, steel tapes, textiles and other commodities; it has also ship yards, fisheries and planing mills. The local nurseries and rose gardens are noted. Patchogue is a popular summer resort. The village was settled in 1665 and incorporated in 1893. Pop. 1920, 4,031; 1930, 6,860.

**PATEN**, a perfectly smooth, round, flat plate, of gold or gilded and about as large as a hand, in which the Host is placed at Mass. In the early Church it was first deep, then flat, and of glass and metal, frequently ornamented. A paten is used to distribute the consecrated bread to the faithful.

**PATENT**, a document which discloses the specifications and claims for an INVENTION and confers a monopoly on the manufacture, use and sale of the article described for a stated period, 17 years in the United States. A patent is in effect a contract between the State and the inventor by which the inventor receives exclusive rights for disclosing the complete details of his invention so that it may be used by the public at the expiration of the patent. If the inventor fails to enter complete specifications of his invention in the patent, as is sometimes done to keep some vital part of it secret, the patent is void and anyone supplying the part omitted may obtain a valid patent on the invention. Patents may be secured on original and useful discoveries or inventions and on improvements thereof provided they are not known or used by others in the country of origin, have not been described in any printed publication and have not been in public use or sale for more than two years

## PASTEL



COURTESY METROPOLITAN MUSEUM OF ART

### FRENCH AND AMERICAN PASTELS

1. "Portrait of George Moore," by Edouard Manet (1832-1883).
2. "Mother and Child," by Mary Cassatt (1855-1926).
3. "The Rehearsal on the Stage," one of the many ballet scenes by Edgar H. Degas (1834-1917).





previous. Patents on legitimate inventions not already patented may be obtained by anyone regardless of age, nationality, race or character. To obtain a patent in the United States, application is made to the Commissioner of Patents who refers it to the proper examiner to determine whether it is new and useful and whether it has been anticipated here or abroad. If no objections are found the patent is granted. An application for a patent must include an oath by the inventor to the effect that he believes himself to be the first inventor; complete specifications of the invention and the claims made for it; and a set of drawings where possible.

**PATENT MEDICINES.** What are colloquially called "patent medicines" are, in fact, not patented medicines—that is, they are not products on which the government has issued letters patent. They are, in fact, package medicines, usually secret in composition, sold direct to the public for self-medication purposes. They are invariably sold under trade-marked names and the element of monopoly rests on these trade marks. The name seldom has any relation to the composition, and the composition may be changed as expediency dictates and wholly unknown to the purchaser. The government asks no questions regarding the composition of the thing that the trade-mark is to represent. Because of the secrecy surrounding the composition of such preparations and the fact that they are sold for the self-treatment of self-diagnosed ailments, it is not surprising that the industry has had more than its share of fraud.

The NATIONAL FOOD AND DRUGS ACT went into effect January 1, 1907. The passage of this law was the result of a fight made by physicians and health officials over a long period of years in the face of great opposition. The final crystallizing of public opinion that brought about the passage of the law was due to the campaign carried on by a few high-grade magazines—of which *Collier's* was the most notable example—which brought to the public a visualization of the evils of the uncontrolled sale of drugs and foods.

The National Food and Drugs Act, in its application to "patent medicines," gives the American public the following protection: First, it forbids the making of false or misleading statements on or in the trade package regarding the composition or origin of the product and forbids false and fraudulent claims for curative effects; second, it requires the seller of "patent medicines" to declare on the trade package the presence and amount of any of eleven drugs or derivatives of these drugs: Alcohol, morphine, opium, cocaine, heroin, alpha-eucaine and beta-eucaine, chloroform, cannabis indica, chloral hydrate and acetanilide.

Being a national law, it applies only to preparations that enter into INTERSTATE COMMERCE—that is, that pass from one state to another. Further, it penalizes false, misleading or fraudulent statements only when they appear in or on the trade package. Newspaper advertisements, bill-boards, circulars distributed from the drug counters or from door to door are not subject to the penalties of the Act.

From the public health point of view, the chief indictment of the patent medicine industry lies not in the fact that such preparations may contain—and sometimes do contain—dangerous and habit-forming drugs; the objection is a deeper one. It is that, in the advertising of such preparations, the profit to be made in their sale, due to the monopoly that is granted through the trade-mark law, makes it possible for the manufacturers to spend inordinate amounts of money in high-pressure advertising campaigns. In these campaigns, the trivial and passing indispositions of the public are so played upon and exaggerated as to make persons who have really nothing serious the matter with them think that they are ill, for the sole and only purpose of getting such persons to buy the advertised panaceas.

A. J. C.

**PATER, WALTER HORATIO** (1839-94), British author, was born at Shadwell, Aug. 4, 1839. After graduation he held various positions at Oxford and was the center of a literary circle of devoted followers who looked upon him as the founder and leader of a new literary and humanist cult and the prophet of a new philosophy of life. In his elaborately phrased, sonorous prose Pater sought exclusively the essence of beauty in art and in life, playing upon that essence when he found it with the refined sensuousness of an ascetic who could "burn with a hard, gem-like flame." His most famous work is *Marius the Epicurean*, a few others being *Imaginary Portraits*, *Plato and Platonism*, and *The Renaissance*. He died at Oxford, July 30, 1894.

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**PATERNOSTER**, in the Catholic Church, the name for the Lord's Prayer, so called from the first two words in the Latin version; also the name given to every 11th bead of a rosary, coming to which the worshipper repeats the Lord's Prayer.

**PATERSON, WILLIAM** (1658-1719), British economist, was born in April 1658, in Dumfriesshire, Scotland. He lived in the Bahamas for several years, returning to London where he amassed a fortune in trade. In 1694 he founded the Bank of England. He was the projector of the unsuccessful Darien scheme to establish free trade in a settlement on the Isthmus of Darien. Paterson was author of many works on finance, trade and social and political subjects, among them *An Inquiry into the State of the Union of Great Britain and the Trade thereof*, published in 1717. He died at London, Jan. 22, 1719.

**PATERSON**, a city and the county seat of Passaic Co., N.J., located on the Passaic River, 15 mi. northwest of New York City and 13 mi. north of Newark. Its transportation facilities include the Lackawanna, Erie and Susquehanna railroads, electric trolleys and motor bus lines. Much of the power for the city's extensive industries is derived from the Passaic River which descends about 70 ft. as it borders the city, 50 ft. of which is in one fall (Passaic Falls). The city is the leading center of the country in the production of silks, and it has many other industries including dyeing and finishing and the manufacture

of airplane motors, textile and other machinery, structural steel, cables and boilers. In 1929 its factory products were valued at approximately \$196,000,000. The retail trade amounted to \$85,773,147; the wholesale trade proper to \$30,225,670. Paterson was established in 1792 at the instigation of Alexander Hamilton and is named in honor of William Paterson, a former governor of the state. It was incorporated as a township in 1831 and was granted its charter as a city in 1851. Pop. 1920, 135,875; 1930, 138,513.

**PATHOLOGY**, that branch of medical science embracing the knowledge of changes in a living organism induced by disease.

Historically the recognition of disease dates to the dawn of human intelligence. The earliest records are found in the writings of the Hindus, Chaldaeans, Chinese, and Egyptians. The subject underwent its first orderly arrangement at the hands of HIPPOCRATES and his school in Greece, 400 B.C. Though their progress was great, it was handicapped by a deficiency of anatomical knowledge. HEROPHILUS and GALEN in Greece and CELSUS in Rome added much to knowledge of anatomy and clarified concepts of disease. VESALIUS and PARACELSUS in the sixteenth century made the next great advance in anatomical and pathological knowledge, pointing out the errors in the previous works. In the seventeenth century, HARVEY described the circulation of the blood and LEEUWENHOEK invented the microscope.

In the last half of the nineteenth century great strides were made, the most outstanding being the recognition by VIRCHOW that pathological processes are primarily cellular, and PASTEUR's discovery of the causal relationship of bacteria to disease. The twentieth century has been one of great progress in the field of pathology, with minute classification of disease, and the application of the advances in physiology, chemistry, and physics.

Pathology is subdivided into human, animal, and plant pathological physiology and pathological anatomy. Pathological physiology concerns itself with the functional deviations induced by morbid processes and includes the alterations in the chemistry, i.e., chemical pathology, as well as in the functional activity of the living organism. For example, a gland may secrete an increased amount of its normal product, or the amount may be decreased or entirely lost. On the other hand, the product of this organ may be altered chemically from the normal.

Anatomically, the normal structures may be altered or lost as a result of embryological malformations, as in such conditions as club-foot.

The blood in a structure may be increased, decreased, or entirely absent. An increase (hyperemia) may be due to some stimulus on the blood vessels, causing them to dilate and increase the flow (active hyperemia), or may result from an obstruction causing a piling up in the blood vessels. The amount of blood may be decreased or entirely absent in an organ as a result of partial or complete occlusion of the arteries by solid objects, most commonly blood clots

within the lumen (emboli), by pressure upon the vessel, or by overgrowth resulting in the thickening of the vessel wall.

Regardless of the nature of the forces acting, the response of living tissues to injury is essentially the same, varying only in degree. This reaction to injury is called inflammation, the increase in blood flow in the part involved giving rise to redness. Serum and cells pass through the blood vessel walls into the surrounding tissue spaces, resulting in swelling. The cells of the tissue involved become swollen; on this continued action of the noxious stimulus, the blood vessels dilate, the blood flow slows and finally stops, and the passage of fluids and cells into the tissue spaces, particularly the white cells, increases. The cells may undergo further regressive changes which may terminate in their death. The white cells, which migrated from the blood into the tissues, liberate enzymes which digest the dead or dying tissue cells, forming pus (Abscess). This debris breaks through to the outside, or is partially or completely absorbed. The tissue destroyed is replaced by a growth of connective tissue (scar). If destroyed material is retained, it is surrounded by a dense wall or capsule of connective tissue.

If, instead of a circumscribed local action, there occurs a generalized effect, as the result of a toxic agent being carried through the blood stream, as in pneumonia, the more susceptible tissues undergo degeneration. The particularly susceptible organs are the heart, liver, kidneys and, in some instances, the nervous tissues. The cells of these organs become swollen, and products of degeneration, of which fat is the most common, collect within the cells. Finally they may break down completely.

If, however, the morbid process is moderate and of long duration, changes occur in the protective mechanisms of the body which alter the tissue reaction to the particular morbid agent. This response is of such character that it is recognizable on microscopic examination of tissues. Further, immunity may result, as in the case of diphtheria, with the development of specific immune bodies.

As a result of altered functional demands or because of changes in the physiology of an organ, either of two processes—enlargement or atrophy—may occur. In the first instance, the organ, in increasing its functional output, must needs develop more tissue, the cells increase in number or size, with enlargement of the organ. In the second possibility, the demand for activity may be diminished, or nutrition may be deficient or fedective. Then the cells diminish in size and number, often being replaced by scar tissue, and the organ usually atrophies.

The causative agent or etiology of disease may be any one of several. Mechanical injuries result in destruction of tissue, which is either replaced by scar (or connective) tissue or by a regrowth of the original tissue.

Excessively high or low temperatures cause death of tissues, as will caustic chemicals and actinic rays.

Poisons, acting upon the cell proper, are important etiological factors, and especially bacterial toxins.

Animal parasites, such as intestinal worms, may cause pathological changes, either directly or through toxic product. Similarly, plant parasites, as bacteria, yeasts or molds, may be effective. Bacteria are the most common and potent, and include certain forms which are too small to be seen under the microscope (ultra-microscopic forms), but which can be studied by their effect. Infantile paralysis and smallpox are examples of diseases caused by these agents.

Defects in nutrition, either as an insufficient amount of food or the absence of an essential element, most commonly a vitamin (beriberi and rickets), are becoming increasingly recognized as causes of disease.

Insufficient functional activity or malfunction of the product of an organ, constitutes an especially important causation of disease. Thus diabetes is due to an insufficient formation of insulin by the pancreas, hyperthyroidism is presumably due to malfunction of the thyroid, while disfunction of the heart results in failure of the circulation and dropsy.

Congenital malformations resulting from defects or anomalous development may be due to physical effects, or be hereditary in origin, but primarily they are the result of unknown factors acting in or upon the germinal cells.

Finally, a heterogeneous group of diseases of unknown causes remain for consideration. They include the leukemias, Hodgkin's disease and tumors. Leukemia is characterized by a tremendous proliferation of the white cells and goes more or less rapidly to a fatal termination. Hodgkin's disease affects the lymphoid tissues of the body with the development of characteristic cells in a more or less characteristic arrangement. (See LYMPHATIC SYSTEM, DISEASES OF.) Tumors may be defined as growth or proliferation cells not initiated by physiological needs. Two general groups may be identified: benign tumors which resemble closely the normal tissues and malignant tumors, in which the cells differ more or less radically from the normal, and grow rapidly and wildly, invading surrounding tissues and growing slowly, and being carried by the blood and lymph stream to distant organs. (See TUMORS.)

It will thus be seen that living tissues respond to injury, or to influences within the body or within the cell, either acquired or hereditary; and for a given type of living tissue, a more or less particular response occurs, varying with the nature of the morbid agent, the study of the response constituting the field of pathology.

W. F. P.

**PATIENCE.** See SOLITAIRE.

**PATINA**, a deposit of verdigris or similar mineral compound, resulting from long exposure to the atmosphere or to chemicals, on the surface of bronze objects of art. A good patina takes a polish and its presence prevents further oxidation. The green patina is practically composed of malachite, or hydrated carbonate of copper, and is the most stable. The blue patina is azurite; the red, cuprite. These and others

are liable to decompose in the presence of moisture and turn into malachite. The Chinese and Japanese like an ebony black patina, due to lead in the alloy. Oxidation in non-carbonic alkaline soil produces a red patina. In general, the colors and compositions are controlled by the nature of the alloy, the nature of its environment, the length of time of exposure. A "noble patina" is usually formed very slowly.

Many imitation patinas are produced by the use of paints, waxes, lacquers and sodium silicate. Real patinas are artificially produced by the use of acids and heat. Some of these, especially the chlorides, are extremely corrosive. No hydrochloric, sulphuric nor nitric acid should ever be used. Fumes of organic acids like acetic, oxalic, citric, or carbonic, in a gassing chamber, followed by slow drying and gentle polishing give very good results. See also BRONZE AND BRASS, IN ART: *Patina*.

**PATMORE, COVENTRY** (1823-96), English poet, was born at Woodford, Essex, July 23, 1823, the son of the writer, Peter George Patmore, from whom he received his education. He published his first book of poems in 1844. Ten years later appeared the first part of his best known poem, *The Angel in the House*, called *The Betrothal*. It was followed in 1858 by *The Espousals*, in 1860 by *Faithful Forever*, and in 1862 by *The Victories of Love*. His two favorite short poems, *Toys*, and *It Was Not Like Your Great and Gracious Ways* were included in *The Unknown Eros and Other Odes*, 1877. Late in life Patmore became a Catholic. He died at Lymington, Sussex, Nov. 26, 1896.

**PATNA**, a city of India, the provincial capital of Bihar and Orissa, situated on the Ganges, near its junction with the Son and the Gandak, and about 400 mi. northwest of Calcutta. It extends for 9 mi. along the river, from which tombs, mosques and monuments present a fine appearance. The University of Patna, founded 1917, has been developed in recent years. On the west side of the city is the suburb of Bankipur where the government offices and European residences are situated. By reason of its central position and natural advantages Patna is an important business mart, and the chief seat of the opium trade. The city has given its name to Patna rice, a very fine variety well known in Europe. Pop. 1921, 119,976; 1931, 158,230.

**PATRAS**, the chief seaport of western Greece and capital of Achaia and Elis. It is located on the Gulf of Patras and is connected with Athens by rail. Transportation lines from Patras make it the shipping point for great quantities of currants in addition to wine, oil and hides. Originally Patras was a settlement of Patricians, from which circumstance it derives its name, but following the Hellenistic period it was ruled by the Romans and later by the Turks, from whom the Venetians captured it in 1687. In 1714 the Turks recaptured it and it was not freed of their rule until 1828 during the Greek War of Independence, which had its beginning in that city. During the Middle Ages Patras was the chief center of Greek trade. The

church of St. Andrew is identified with the martyrdom of that saint and is celebrated as the saint's burial place. Pop. 1928, 61,278.

**PATRIA POTESTAS**, the complete authority, including that of life and death, by the head of a Roman *familia*, over all the members thereof, including his wife, wives of sons, persons added by adoption, and slaves, although by custom, all male members of the *familia* were consulted before any serious action was taken. The property held or acquired in any way by anyone under the patria potestas was technically under the absolute control of the *pater familias*. On his death each of the sons became heads of their respective groups, and the mother and unmarried sisters passed to the power of a son. L. K. B.

**PATRIARCH** denotes the father or ruler of a family, tribe or race; but in ecclesiastical usage it has become a title of dignity. The word originated in the Septuagint version of the Bible, where it is applied to religious and civil officials. It has become common to call the following patriarchs: (1) the 10 antediluvian family chiefs; (2) the three great progenitors of the Israelites: ABRAHAM, ISAAC and JACOB, and (3) the 12 sons of Jacob. As a Christian title of honor, the word patriarch is used first of Pope Leo I, in a letter by Theodosius II (408-50). It soon came to equal a prince of fathers, patriarchs enjoying precedence over primates, metropolitans and bishops, but not over cardinals. Pope Innocent III distinguished the patriarchs in the following order of dignity: Rome, Constantinople, Alexandria, Antioch and Jerusalem. The bishops of the Byzantium jurisdiction still apply the name to their chief. In the Orient there are patriarchs of different rites, such as the Armenian, which has four patriarchs; the Chaldean; the Melchite, or Nestorian; and the Maronite of Antioch. There are also minor patriarchates, such as Venice, Lisbon and the East and West Indies. The term patriarchate is variously used for the office, the see, the reign or more commonly, the territory, of the patriarch. The titular Latin patriarchs have only ceremonial prerogatives. The title of patriarch is sometimes popularly conferred on elderly or notable individuals, as when reference is made to Voltaire as the "Patriarch of Ferney" or to John White (1547-1648) as "the Patriarch of Dorchester."

**PATRICIAN** (Latin *patricius*), under the kings of Rome, the citizens in general, for the **PLEBS** were not yet full citizens. Under the early republic they had the exclusive right to hold offices, to vote in the comitia centuriata (see **COMITIA**), perform religious duties, but they gradually lost these prerogatives and their hold on the offices except for certain religious ceremonies.

**PATRICK, ST.** (c. 389-461), apostle of Ireland, was born about 389. His birthplace is disputed. He was carried off to captivity in Ireland by a band that raided his native village. This event is supposed to have taken place in his sixteenth year, so that he had already received a Christian training as a Briton under the Roman Empire. After several years in

bondage, St. Patrick escaped to Gaul and lived for a time in a Gallic monastery. He then returned home, but religious zeal induced him to return to Ireland and engage in converting the heathen Irish to Christianity. There is also the tradition that he received his mission from Pope Celestine at Rome about 432. At any rate, his personal magnetism appears to have been so great that he won the friendship and allegiance of the many tribal chieftains of the day, a necessary preliminary to the conversion of the Irish heathen. He established a number of churches in Connaught and possibly in Ulster, and his great organizing genius now stood him in good stead. The famous church and monastery at Armagh, which he founded in or about 444, gradually became the center of ecclesiastical authority in Ireland. Here, as Bishop of Armagh, St. Patrick directed for many years the complicated machinery of the Irish Church. Near the end of his life he resigned his bishopric to a disciple and spent the rest of his days in meditation and worship. He died in 461, probably at Down in Ulster. Several important manuscripts, still extant, are attributed to him, but their authenticity is in doubt. The saint's feast is celebrated on Mar. 17.

**PATRIMONY OF ST. PETER.** See **PAPAL STATES**.

**PATRIOTIC SOCIETIES**, organizations whose general purpose is to foster love of country, and which usually commemorate one or more great events of the past. The oldest in the United States is the **SOCIETY OF THE CINCINNATI**, organized in 1783. Among other American patriotic societies are the Sons of the American Revolution (1889), Daughters of the American Revolution (1890), Colonial Dames of America (1890), Society of Colonial Wars (1892), Society of Mayflower Descendants (1894), Grand Army of the Republic (1866), Veterans of Foreign Wars (1913), and American Legion (1919).

**PATROCLUS**, in Greek mythology, son of Menoetius, and faithful friend of **ACHILLES**. He followed this hero to the Trojan War where he was killed by Hector. At his death Achilles resumed his part in the fighting from which he had withdrawn on account of his quarrel with **AGAMEMNON**.

**PATROL**, a military term generally used for a small detachment of soldiers assigned either for combat or reconnaissance duty. A combat patrol is sent out on a mission that involves fighting. Patrols sent out solely for the purpose of seeking enemy intelligence are reconnaissance patrols; their mission usually requires that they avoid fighting. While a combat patrol may consist of a squad or even a **PLATOON**, a reconnaissance patrol rarely consists of more than three or four men.

**PATROLLING.** See **SCOUTING**.

**PATRONS OF HUSBANDRY**, a fraternal society, founded in 1867 as the National Grange of the Patrons of Husbandry. The members, who were associated in the interests of agriculture, were popularly called Grangers and in 1876 there were more than 1,500,000 members and 1,900 lodges or granges.

When the organization became powerful it began to have influence in curbing political and business policies detrimental to the farmer. This was contrary to the original aims which were primarily educational and social. Later the political element withdrew and joined the Farmer's Alliance and Populist Parties.

**PATROONS**, landed proprietors of New Netherland, or colonial New York. The Dutch West India Company in 1629 granted valuable exemptions and several feudal privileges to its members who established colonies of at least 50 persons 15 years of age in New Netherland. These colonizers were called patroons, i.e., protectors; each was given absolute title to extensive tracts of land along the navigable rivers. Patroons could hold civil and criminal courts and, after 10 years' tax exemption to each tenant, were permitted to collect certain rentals. They were not allowed to manufacture, this being an exclusive perquisite of the Dutch West India Company itself. In 1640 patroonships were made available to non-members, and the size of the grants reduced. The patroons were, in effect, a landed aristocracy. The seizure of New Netherland by the English did not disturb their status; but in 1775 they lost their feudal privileges, except a nominal right to collect rent. See ANTI-RENT PARTY.

**PATTEN, SIMON NELSON** (1852-1922), American economist, was born at Sandwich, Ill., May 1, 1852. He took his degree as doctor of philosophy at Halle, Germany, in 1878. He was professor of political economy at the University of Pennsylvania from 1888 to 1917. In 1908-09 he was president of the American Economic Association. An original thinker, he was chiefly interested in the relation of the natural sciences to sociology. Among his books were *The Stability of Prices*, 1888, *The Theory of Prosperity*, 1892, *The New Basis of Civilization*, 1907, and *The Reconstruction of Economic Theory*, 1912. He died at Brown's Mills, N.J., July 24, 1922.

**PATTERN MAKING**, the preparation of models or patterns from which foundry castings can be made. These patterns are generally made of wood but metal is used when a very large number of castings is to be made. Patterns must be of the required shape and enough larger than the finished casting to allow for the shrinkage exhibited by most metal on cooling in the mold. Molds are usually made of sand which is rammed around the pattern, after which the pattern is removed. If the casting is to be hollow, a suitable "core" of baked sand is placed in the mold in such a way that metal will flow around it. On some intricate shapes it is necessary to divide or part the pattern in several places in order to remove it from the mold after the sand is rammed around it. Nearly all patterns used in molding machines are made of metal. See CASTING; FOUNDRY.

**PATTI, ADELINA** (1843-1919), great Italian soprano singer, was born at Madrid, Feb. 19, 1843. She first sang in public in New York, at the age of seven. She made her operatic début in that city, singing Lucia when she was 15. In 1861 she appeared

in London, evoking much enthusiasm, and sang there for more than 20 years, making American tours at frequent intervals. Her repertoire was large, her voice high, clear, even and rich, possessed immense range and a high artistic finish, which, together with her beauty and vivacity, made her a favorite in many countries. She retired in 1906, and died in her Welsh castle, Craig-y-Nos, Sept. 27, 1919.

**PATTISON, MARK** (1813-1884), English scholar, was born at Haukwell, Yorkshire, Oct. 10, 1813, and educated at Oxford. As tutor at Lincoln College, Oxford, in 1843-55, and as rector after 1861, he was responsible for advancing Lincoln to a high place among colleges. A foremost scholar at Oxford, he wrote a number of philosophical and theological works and an excellent *Life of John Milton*. Pattison died at Harrowgate, Yorkshire, July 30, 1884.

**PATTON, FRANCIS LANDEY** (1843- ), American educator and theologian, was born at Warwick Parish, Bermuda, Jan. 22, 1843. He graduated from Princeton Theological Seminary in 1865. The same year he was ordained to the Presbyterian ministry, and until 1881 held pastorates in New York State and Chicago, Ill. In 1872 he was appointed professor of theology at Theological Seminary of the Northwest (now McCormick Seminary), where he remained nine years. From 1881-88 he was professor of the relations of philosophy and science to the Christian religion at Princeton Theological Seminary. In 1888 he was elected president of Princeton University, then called the College of New Jersey, and served in this office until 1902, when he resigned and was appointed professor of religion at Princeton Theological Seminary. He also held the chair of ethics at Princeton University 1886-1913. Patton was prominent in the heresy trials of Prof. David Swing, 1874, and Dr. Charles A. Briggs, 1892.

**PATWIN**, one of the two divisions of the North American Indian Copehan or Wintun linguistic stock, which has itself been combined with several others by some authorities to form the stock known as Penutian. The dialects of Patwin were distinct from those of Wintun. The Patwin lived in the district from Stone Creek, Colusa Co., to Suisun Bay, Solana Co., Cal., and from the Sacramento River to the westward boundaries of the Kulanapan area. Culturally the Patwin near the coast differed from the interior groups. The coast people lived in dome-shaped, earth-covered, semi-underground houses; the interior groups made houses of wood without the earth roofing. They practiced decapitation of captives, especially girls, taken in war; had harvest ceremonies, and buried their dead, though some groups practiced cremation.

**PAU**, a town in southern France and the capital of the department of the Basses-Pyrénées. It was the capital of the kingdom of Bearn, and Henry IV of France, Prince of Bearn, was born here. The castle, rebuilt several times, is the town's chief historic landmark. Its mild climate and its magnificent mountain view are its great attractions, making the town a famous winter resort. Pop. 1931, 38,962.

**PAUL, ST.**, the adopted name of Saul, "the apostle of the Gentiles," was born at Tarsus in Cilicia. He was a Jew of the tribe of Benjamin and a strict Pharisee, and inherited Roman citizenship. His usual language was the colloquial Greek, then prevalent. Saul was educated at Jerusalem under the liberal Rabbi Gamaliel and, about 36 A.D. he assisted as a young man, at the martyrdom of Stephen. With a view to suppressing the Christian Church, Saul was proceeding to Damascus when a vision led to his sudden conversion. While the chronology is obscure, it is



ST. PAUL

After an engraving by Martin Schongauer

clear that Paul, as he was now called, retired for a period into Arabia and returned to Damascus where he escaped from the Jews by means of a basket lowered from the walls, after which experience he visited Peter in Jerusalem. Also, he lived for a time at Tarsus where he was sought by Barnabas whose nephew, John Mark, was the reputed author of the second gospel. Barnabas brought Paul to Antioch where a flourishing church had risen. This church was not content with the Judaic limitations of Christianity held at Jerusalem, and Paul, with Barnabas, was authorized to carry the gospel westwards. There followed three evangelizing tours. The first, dated about 45 A.D., was limited to Cyprus and eastern Asia Minor. The second, about 50 A.D., was undertaken by Paul with Silas as companion. Among notable incidents were the dramatic release from prison at Philippi and the sermon on Mars Hill at Athens. The third tour, dated about 54 A.D., was mainly in Greece and Asia Minor. It included a riot at Ephesus, provoked by devotees of the goddess Diana. Returning to Jerusalem about 60 A.D., Paul had to be rescued from his Jewish opponents by Claudius Lysias, the Roman commandant. The Apostle was sent to the governor, Felix of Caesarea, before whom he uttered a memorable defense. He also appeared before Festus, the successor to Felix, and Herod Agrippa, King in northern Palestine. As a Roman citizen, Paul appealed to Caesar for a hearing of his case and was sent to Rome. Off Malta, the ship suffered a memorable shipwreck. The Scriptural narrative, contained in the Acts, ends abruptly with the statement that Paul, as a prisoner, was living in his own hired house, where probably he was chained to a soldier. The accepted tradition is that St. Paul was beheaded under Nero at an age somewhat over 60 years.

The epistles of St. Paul, 13 in number, are included in the New Testament, but not in chronological order, which probably should be as follows: I and II Thessalonians; I and II Corinthians; Galatians; Ro-

mans; Philippians; Colossians; Philemon and Ephesians; I Timothy; Titus, and II Timothy. The Epistle to the Hebrews, attributed to St. Paul, is of uncertain authorship. Paul's writings include doctrines, exhortations and many personal allusions.

St. Paul was the only apostle who did not see Christ when on earth. His great achievement was the declaration of Christianity as a world-wide faith, absolutely without traditional or geographical restrictions. He took the Judaic background of the Church and translated it into universal terms. Apparently, he suffered from defective eyesight and from some distressing malady which he described as "a thorn in the flesh." In stature, he seems to have been small, this being the meaning of the word, Paul.

**PAUL**, name of five popes. St. Paul I, 757-767, like his brother and predecessor, attached himself to the Frankish King Pippin to avoid the attacks of the Lombards and the pretensions of the Greek emperors. Paul II, 1464-71, did not keep his preelection promises. He inaugurated the "Jubilee Year." Paul III, 1534-49, previously Alessandro Farnese, was a highly educated man and an intelligent diplomat. While at first he was not bitter against the Reformers, he later took drastic steps. In 1545 he opened the Council of Trent. His excommunication of Henry VIII completed the breach with the Anglican Church. Paul IV, 1555-59, joined the Theatines, formed a commission for Church discipline, made minute regulations for the clergy, extended the jurisdiction of the Inquisition and introduced the index of forbidden books. His severity made him so unpopular that the populace threw his statue in the Tiber. Paul V, 1605-21, a severe interpreter of canon law, refused the State any influence in ecclesiastical affairs and quarreled with the Venetian Republic. He did a great deal for the beautifying of Rome and the Vatican.

**PAUL AND VIRGINIA**, a pastoral romance in French by BERNADIN SAINT-PIERRE; published 1788. This is the idyllic tale of two children, Paul and Virginia, who, after growing up together on the island of Mauritius, are separated by an aunt of Virginia, who sends the girl to France to be educated. Virginia refuses to marry the "civilized" man of her aunt's selection, and is ordered to return to the island. But as her ship comes within sight of her old home, it is wrecked and Virginia is drowned. Paul dies of grief soon after.

**PAUL-BONCOUR, JOSEPH** (1873- ), French Socialist, was born at St. Aignan, Aug. 4, 1873. His vigorous support of trade-unions enabled him to win a seat in the Chamber of Deputies on an independent Socialist ticket in 1906, and he became in 1911 Minister of Labor. In 1914 officially entered the socialist party and was twice reelected to the Chamber. In 1928 he was appointed delegate to the League of Nations from France but resigned when his party found it impossible to support the policies of the Poincare government.

**PAULDING, JAMES KIRKE** (1779-1860), American writer, was born at Nine Partners, N.Y.,

Aug. 22, 1779. At 19, with William and WASHINGTON IRVING, he brought out the literary periodical, *Salmagundi*. During the war of 1812 he wrote clever patriotic satires, and he continued to combat British criticism with the humorous irony in which he excelled. He was Secretary of the Navy under Van Buren, retiring in 1841. Among his writings are *John Bull in America*, *The Dutchman's Fireside* and *Westward Ho!* He died at Hyde Park, N.Y., Apr. 6, 1860.

**PAULICIANS**, an evangelical Christian sect, existing in Armenia and Asia Minor in the 5th century, and spreading later to the Balkan peninsula. Although they were not pure Manichaeans (see MANICHAISM), as they have been frequently represented, they were dualists, believing in two distinct principles, the God of the material world, and the God of the spiritual world. They held matter to be inherently evil. The Eucharist and the incarnation were allegorized by them, while their Baptism consisted of hearing the Word of God. They were iconoclasts, rejected the Old Testament, accepted as Scripture only the Gospels and the epistles of Paul, and repudiated Peter as having denied Christ.

The Paulicians flourished throughout the Middle Ages, particularly in the 9th century under their greatest representative, Sergius. Their influence spread to several of the so-called Manichaean sects of medieval times. The sect is still found in Armenia.

**PAULINUS OF NOLA, ST.** (353-431), bishop of Nola, was born at Bordeaux in France about 353 of a noble family. Educated by the poet Ausonius, he became one of the most cultured scholars of his generation. He numbered among his friends St. Ambrose and St. Martin. After distributing his wealth among the poor he lived as a hermit until he became bishop of Nola, near Naples, Italy. Paulinus was captured by the Goths during one of their invasions. He escaped, however, and died in 431 at Nola. His Latin poems are still admired and his feast is celebrated on June 22.

**PAULISTAS.** See LATIN-AMERICA.

**PAULISTS**, members of the Missionary Society of St. Paul the Apostle, which has for its aim the propagation of the Catholic faith in America. Its headquarters are in New York where Father Isaac T. Hecker, a former Redemptorist permitted to leave the order, established himself and four companions in 1858 under a rule similar to that of the Redemptorists. Through lectures, sermons, missions and publications which include the monthly magazine, "The Catholic World," the work of the congregation prospered and foundations were made in Washington, Toronto, Chicago, San Francisco and elsewhere in the United States; abroad, in England and Australia. There is a house of studies in Rome. A total membership of about 125 in 1931 included priests and novices.

**PAULOWNIA** (*P. tomentosa*), a catalpa-like tree of the figwort family often planted for ornament. It is a native of China, widely grown in mild climates

and naturalized through escape from cultivation from southern New York to Georgia. The tree grows about 40 ft. high with broad heart-shaped or three-lobed leaves and conspicuous, pale violet, fragrant flowers borne in large terminal clusters.

**PAUL PRY**, in a comedy of that name by John Poole. He is an excessively inquisitive person, perpetually meddling in the affairs of other people, but in both his best and his worst moments he always hopes that he is not "intruding."

**PAULSBORO**, a borough of Gloucester Co., N.J., located on the east bank of the Delaware River 10 mi. south of Philadelphia, Pa. It is served by the Pennsylvania Railroad and motor bus lines. Among the local industries are numbered the refining of petroleum and the manufacture of rugs and fertilizers. It received its charter as a borough in 1904. Pop. 1920, 4,352; 1930, 7,121.

**PAULY SILK.** See CUPRAMMONIUM SILK.

**PAVEMENT.** See ASPHALT PAVING; BRICK PAVEMENTS; CONCRETE ROADS AND STREETS; GRANITE BLOCK PAVEMENTS; MACADAM ROADS; PAVEMENT BASES; PAVEMENT SUBGRADES; SURFACE TREATMENT.

**PAVEMENT BASES**, the foundations of road or street pavements, which rest on the soil or Subgrade and are covered by a Pavement Surface. The base receives the loads of the vehicles consisting not only of the dead weights of the vehicles and loads but also of the impact pressure produced by moving wheels. Irregularities of a fraction of an inch greatly increase the pressure on the pavement, and those of 2 inches or more, as at a bad "chuck hole," are equivalent to doubling the load.

Subgrades in well drained sandy soil resist the direct pressure of the wheels, and need surfaces only to resist abrasion. On less resistant soils the weight must be spread over larger areas by the provision of bases of considerable strength. Bases may consist of layers of macadam or of relatively stiff bituminous concrete "black base" 2 to 6 inches deep, or nearly rigid slabs of concrete 4 to 10 inches thick.

For bases supporting heavy loads the thickness in inches should be about equal to  $\sqrt{\frac{L}{250}}$  for high grade concrete on good subgrades where L is the total weight of the heaviest truck in pounds. W. W. H.

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**PAVEMENT SUBGRADES**, the prepared ground on which STREETS, HIGHWAYS or PAVEMENT BASES are laid. Bases receive the weight of the vehicles and transmit it as pressure to the subgrade. If the subgrade yields to pressure the pavement will ultimately break down. The most satisfactory subgrades are rock, or gravelly, sandy and gritty soils reasonably well drained. Loams and silts are better than clays. The more plastic the soil, the poorer is its supporting power when damp. Plastic soils also shrink and swell with changes in moisture content, causing destructive strains in the pavement.

Preparation of a permanent subgrade demands good



drainage. For roads this may be in part by side ditches, but often tile drains are needed. For streets with CURBS, pipe drains and sewers are needed. In fine, plastic soils, moisture may be lifted five to ten feet by capillary action (*see* CAPILLARY PHENOMENA), and drainage systems must be set very deep to produce a dry surface. Sometimes plastic soils cannot be drained and must be removed to a depth of several feet, or coarsened by the harrowing in of sand or stone; or else a layer of sand or rock "screenings" is placed over the soil. Subgrades must be thoroughly compacted and carefully finished to fit the bottom of the pavement or base. W. W. H.

**PAVIA**, the capital of the province of the same name, in northwestern Italy, the seat of a bishop, and of a university founded 1361. It is situated near the confluence of the Ticino and the Po rivers in Lombardy. The large cathedral was begun 1488, and is said to have been one of 165 churches in the city at that time. The old Church of San Pietro in Cielo d'Oro, rebuilt as early as 1100, contains the handsome tomb of St. Augustine. In the 11th century Church of San Michele Maggiore, several medieval German sovereigns, including Emperor Frederick I Barbarossa, assumed the Lombard crown. Prominent secular buildings are the university, built 1490; the old castle of the Visconti, now a barracks; the Malaspina Palace with picture gallery and collection of engravings; two theaters, and various monuments. A short distance north of the city is the well known and beautiful Carthusian monastery, the Certosa di Pavia. The city was the Roman *Ticinum*. It was the residence of Theodoric, king of the East Goths from 490 until it became capital of the Lombard realm in 572. There were numerous revolts against the German emperors and their Italian adherents, and in 1359 the Visconti captured the city and united it with Milan. Taken by the French after Francis I of France had been captured at the BATTLE OF PAVIA in 1525, Pavia became Spanish, then Austrian, and in 1859 fell with Milan to the kingdom of Sardinia. The city has many factories producing diversified commodities; and a busy trade, chiefly in agricultural products. Pop. 1931, 50,325.

**PAVIA, BATTLE OF.** During the so-called Italian Wars of the 16th century, the King of France, FRANCIS I, while pursuing his dynastic ambitions seized Milan without effort but imprudently allowed a division of his forces for the seizure of the wealthy kingdom of Naples farther South, while he himself headed the siege of the city of Pavia. The disappointed Constable of France, CHARLES BOURBON, together with the leaders of the Imperialist troops, Pescara and Lannoy, gathered forces from all quarters and enclosed Francis between them and the town. Against the advice of his older generals, Francis refused to raise the siege and decided to give battle, Feb. 25, 1525. He threw his men-at-arms too soon into the fray, in view of the presence of 6,000 men in the Pavia garrison. The Spanish infantry, then the best in Europe, cut down the French, killed Francis's best generals, routed

his Swiss mercenaries, and wounded the King himself. He was finally forced to surrender, held captive in Madrid, and compelled to sign the treaty of that name. The Battle of Pavia is especially remembered by Francis I's own summary of it in his letter to his mother: "All is lost save our honor."

**PAVIOTSO**, a group name including several small North American Indian tribes speaking the Mono-Paviotso dialect of the Shoshonean linguistic stock. This group lives in western Nevada and is also often loosely termed PAIUTE.

**PAVLOV, IVAN** (1849- ), Russian physiologist, born Sept. 14, 1849, in the district of Ryazan in Russia. He studied science at the university and medicine at the military medical academy of St. Petersburg (Leningrad), and received his M.D. degree in 1883. His contributions to physiology have been numerous, including methods of operating on animals so as to study the process of digestion, establishing the existence of enzymes or ferments in the body juices, and his studies of nervous and mental phenomena as related to sleep and emotion. The conditioned reflex as a phenomenon is credited to him. He was awarded the Nobel prize in 1904 for his volume on the digestive glands. Professor Pavlov has been elected a member of many noted societies, such as the Royal Society and the Royal College of Physicians, London. M. F.

**PAVLOWA, ANNA** (1885-1931), Russian dancer, was born at St. Petersburg (Leningrad), Jan. 31, 1885. After her early training at the Imperial Ballet School, she became prima ballerina at the Marianski Theater, St. Petersburg. In 1910 she scored successes in London, Paris and New York. Subsequently Pavlowa appeared in London, and toured throughout the world. Among the productions in which she danced were *Les Cygnes*, *Les Papillons*, *Les Sylphides* and *Coppelia*. She died at The Hague, Jan. 22, 1931.

**PAVO** (gen. *Pavonis*), the peacock, one of the most brilliant constellations near the south pole of the heavens, containing one brilliant blue star of the second magnitude, Alpha Pavonis, and six or seven stars of the third and fourth magnitude. Alpha Pavonis is visible from southern Florida and Texas, low down near the southern horizon during early evenings in September. The remainder of the constellation does not rise until one is well inside the tropics. *See* STAR: map.

**PAWHUSKA**, a city in northeastern Oklahoma, the county seat of Osage Co., situated on Bird Creek, about 54 mi. northwest of Tulsa. Two railroads serve the city. There is an airport here. Cotton, grain and live stock are raised in the vicinity. The great wealth of the community is due, however, to the abundant oil fields in this region, containing some 9,000 wells. Pawhuska is in territory inhabited by the Osage Indians. In 1873 the Government established here the Osage Agency. In 1906 the locality was chosen and surveyed, to be one of the five towns selected within the Osage Nation. Pawhuska is a trading center. The Osage Indians, due to oil on

their land, have received millions of dollars in royalties. Pop. 1920, 6,414; 1930, 5,931.

**PAWNBROKER'S SIGN**, three golden balls. This well-known symbol probably dates back to the Medici family of Italy, noted medieval money lenders. The three golden balls of the Medici device were taken, according to one tradition, by Averardo de' Medici, founder of the family, from the giant Mugello, in the 9th century; according to another tradition, they are three gilded pills, referring to the Medici's former profession of medicine.

**PAWNEE**, a confederacy of four Caddoan-speaking North American Indian tribes, the Skidi, Chaui, Kitkahahki and Pitahaurata. Their territory originally comprised the valley of the Platte River, Nebraska. They were agriculturists and hunters. During that portion of the year when they were caring for their fields of maize, pumpkins and other Indian vegetables they lived in permanent earth lodges but when hunting lived in skin tipis. Their rituals and ceremonials were numerous and elaborate and had chiefly to do with the planting of maize and with bison hunting. The Skidi sacrificed a captive girl as the symbol of fertility to the Morning Star at the time of corn planting. They were a powerful and warlike people, constantly fighting with surrounding tribes, though they never fought as a tribe against the French or English in America. The division of Pawnee scouts rendered invaluable aid to the United States in subduing northern Plains tribes. After 1850 the Pawnee suffered a swift decline. In 1876 they sold their lands, were given a reservation in Oklahoma and, in 1892, admitted to citizenship.

**PAWNEE**, a town in northern Oklahoma, the county seat of Pawnee Co. It is situated 60 mi. northwest of Tulsa and is served by bus and truck lines and two railroads. The town lies in a farming and stock-raising country, which also has some oil. The Pawnee Indians were brought here from Nebraska in the '70s. The town was laid out in 1892. A short distance west is Old Town, privately owned, which has a replica of a trading post, also a buffalo ranch. Pop. 1920, 2,418; 1930, 2,562.

**PAWTUCKET**, a city of eastern Rhode Island, on both sides of the Pawtucket or Seekonk River (local names for the Blackstone River), 4 mi. north of Providence; it is served by the New Haven Railroad, motor bus lines, a steamboat freight line and What Cheer Airport. Picturesque waterfalls furnish power for diversified and important industries. Pawtucket, the birthplace of the cotton goods industry of America, now supports all kinds of textile manufacturing, including cotton, silk, woolen and rayon mills, tennis racquet, machine tool, textile machinery, wire making and numerous other enterprises. In 1929 the approximate value of manufactured products was \$112,000,000; the retail trade amounted to \$38,410,048. River traffic from Providence was 493,510 tons in 1929, with a valuation of \$45,577,534. Extensive parks, buildings, bridges and other structures make Pawtucket an attractive city.

About 1690, Joseph Jenks, an ironworker, settled here and initiated a thriving iron industry. About a century later, in 1790, Samuel Slater built America's first cotton mill, which produced the first goods made by Arkwright machinery; it is still standing. Pawtucket is an Indian name meaning *fall of the waters*. The section lying east of the river originally belonged to Massachusetts but was transferred to Rhode Island in 1862. In 1885 it became a city. Pop. 1920, 64,248; 1930, 77,149; about one-third foreign-born.

**PAX**, in Roman mythology, the same as the Greek Eirene or Irene, goddess of peace, was daughter of JUPITER and Themis and one of the HORAE. She is usually represented carrying a cornucopia and olive branch.

**PAX** (a Latin word, meaning peace). 1, A salutation frequent in both the Old and New Testaments and preserved in the liturgy. At present *pax vobiscum* ("Peace be with you") is reserved for the bishops and prelates, while the priests pronounce the words



COURTESY M. M. OF ART

PAX OF MOTHER-OF-PEARL, CARVED WITH THE CRUCIFIXION SCENE (NUREMBERG, LATE 16TH CENTURY)

*Dominus vobiscum* ("The Lord be with you") as the introduction to most of the prayers. 2, In the early Church, the kiss customary at Communion and still observed in the Roman Catholic Church at High Mass in a strictly conventional, symbolic manner.

**PAYNE, JOHN HOWARD** (1791-1852), American actor and playwright, was born at New York City, June 9, 1791. His first play, *Julia*, was produced in 1806 in New York, and three years later he won success as an actor. His fame rests chiefly upon his song, *Home, Sweet Home*, first sung in 1823 at Covent Garden, London. He was appointed

consul at Tunis, Africa, in 1842, and died there Apr. 9, 1852.

**PAYNE-ALDRICH TARIFF, 1909.** The Republican party platform in 1908 pledged a revision of the tariff, assumedly downward. Congress convened in special session, Mar. 15, 1909, solely to enact tariff legislation. A moderate measure presented by Sereno A. Payne, chairman of the Ways and Means Committee, passed the House. Protectionist interests in the Senate, headed by Nelson W. Aldrich, transferred certain items, including coal and iron ore, from the free list to the dutiable lists, and raised important rates. The resultant measure, the Payne-Aldrich act, in effect Aug. 5, 1909, represented an average increase of 1.1 per cent over the protectionist tariff of 1897. Hides were placed on the free list, and duties on leather, shoes and harness reduced; but rates on cotton goods and silks were advanced, and on sugar were retained at a high level. The old rates on wool and woolsens were substantially maintained, although woolen manufacturing companies were paying dividends of 50 per cent. Public disappointment was keen. The tariff alienated several congressmen from the Middle West from the regular Republicans. At Winona, Minn., Sept. 17, President Taft, on a speech-making tour, pronounced the tariff "the best the country ever had," thereby accentuating the division within his party and contributing to the dissatisfaction that resulted in the rise of the PROGRESSIVE PARTY.

**PAZARDJIK** (*Tatar-Pazardjik*), a Bulgarian district capital in East Roumelia, situated in a fruitful plain on the Maritza River and on the old highway to Constantinople. Rice, millet and tobacco are cultivated. There are important woolen, cotton and silk-weaving mills. Pop. 1931, 21,617.

**PEA** (*Pisum sativum*), a smooth annual plant of the pea family widely grown as a vegetable. The origin of the pea, which is no longer known in the wild state, is a matter of doubt, but it is believed to have been a native of western Asia. The plant was cultivated by the Greeks and Romans and the seeds have been found in the remains of the Swiss Lake Dwellers.

The reclining or climbing stem, sometimes 6 ft. high, bears oblong entire leaves, usually white flowers and a nearly straight pod, 2 to 4 in. long, containing 2 to 10 smooth or wrinkled edible seeds. These are mostly used when unripe as a table vegetable. Numerous varieties are in cultivation as the early dwarf pea (var. *humile*), scarcely climbing, with small pods, and the edible-podded pea (var. *macrocarpon*), with large soft pods sometimes 6 in. long, which are eaten together with the seeds. In the United States the pea is one of the leading garden vegetables and is grown in many districts on an extensive commercial scale. In 1927 the value of green peas marketed fresh amounted to \$9,838,620, California producing 43% and New York 17% of the total. In the same year the total value of green peas marketed for canning was \$12,472,150, of which Wisconsin produced about 53% and New York about 15%.

Statistics for the production and canning of peas in the United States is as follows:

**CANNED PEAS, PACKED IN THE UNITED STATES**  
5-Year Average, 1926-30

Division	Pack (Cases)	% of Total
UNITED STATES . . . . .	17,831,000	
LEADING STATES:		
Wisconsin . . . . .	8,995,000	50.4
New York . . . . .	2,272,000	12.7
Utah . . . . .	1,178,000	6.6
Maryland . . . . .	945,000	5.3
Illinois . . . . .	837,000	4.7
Minnesota . . . . .	785,000	4.4

**PEAS FOR CANNING, PRODUCTION, UNITED STATES**  
4-Year Average, 1927-30

Division	Acreage	Production (1,000 Lbs.)	% of Tot. Prod.
UNITED STATES . . . . .	216,448	397,108	100.0
LEADING STATES:			
Wisconsin . . . . .	104,750	196,534	49.5
New York . . . . .	31,245	51,202	12.9
Utah . . . . .	10,838	27,149	6.8
Maryland . . . . .	10,975	19,481	4.9
Michigan . . . . .	9,865	15,179	3.8
Illinois . . . . .	10,335	9,003	2.3

**GREEN PEAS, COMMERCIAL PRODUCTION,  
UNITED STATES**

4-Year Average, 1927-30

Division	Acreage	Production (Bu.)
UNITED STATES . . . . .	68,732	5,774,000
LEADING STATES:		
California . . . . .	31,488	48.0
New York . . . . .	7,905	13.6
Colorado . . . . .	6,948	8.3
Nor. Carolina . . . . .	4,048	5.1
New Jersey . . . . .	3,775	5.1
Virginia . . . . .	3,080	4.3

The field pea (var. *arvense*), with pinkish flowers and small seeds, is extensively grown for forage in Canada and to a limited extent in the United States.

A. B. J.

**PEABODY, ELIZABETH PALMER** (1804-94), American educator, was born at Billerica, Mass., May 16, 1804. When only 16 she opened a school in Lancaster, and two years later one in Boston. She taught at the Amos Bronson Alcott school 1834-36, opened a bookshop in 1840 in Boston which became a gathering place for the foremost transcendentalists of the day and for two years published their magazine, *The Dial*. In 1860 she opened the first kindergarten in America, and after studying Froebel's methods in Europe returned to lecture and write extensively on kindergartens. Among her writings are *Kindergarten Culture*, 1870; *The Kindergarten in Italy*, 1872; and *Letters to Kindergarteners*, 1886. She died at Jamaica Plain, Mass., Jan. 3, 1894.

See Doris L. McCart, *Elizabeth Peabody*, 1918.

**PEABODY, GEORGE** (1795-1869), American philanthropist, was born in Danvers, now Peabody, Mass., on Feb. 18, 1795. During the War of 1812 he

served as a volunteer and on his return to civil life became partner in a small dry goods store in Georgetown, District of Columbia. This store proved immediately successful and when, in 1830, Peabody's partner retired, he found himself at the head of an increasingly important concern. Seven years later he started a business in London and in 1843 withdrew from his American business. Peabody's philanthropic bequests were enormous, even judged by the standards prevailing in America to-day. Among other benefactions he gave \$3,500,000 to the trustees of the Peabody Educational Fund to promote education in the Southern States and \$2,500,000 for the purpose of building working-class dwellings in London. As a mark of recognition for his various benefactions Congress gave him a vote of thanks in 1867, while in England Queen Victoria offered him a baronetcy, which he refused. Peabody died in London on Nov. 4, 1869, and his body, brought to America on a British warship, was buried at his birthplace.

**PEABODY, JOSEPHINE PRESTON** (1874-1922), American poet and dramatist, was born in Brooklyn, N.Y., in 1874. She was educated at Radcliffe College. *The Wayfarers*, her first book of poetry, was published in 1898. In 1909 her drama, *The Piper*, won the Stratford-on-Avon Prize, and was performed in England and America. Her other dramas are *Marlowe*, 1901, *The Wings*, 1905, *The Wolf of Gubbio*, 1917, and *Portrait of Mrs. W.*, 1922. Her various books of poetry were collected in 1927. She died at Cambridge, Mass., Dec. 4, 1922.

**PEABODY**, a city in Essex Co., eastern Massachusetts, situated 13 mi. northeast of Boston. It is served by the Boston and Maine Railroad. Peabody is both a residential suburb and an important industrial town, with a large foreign population. In 1929 the valuation of its factory products was \$41,395,206. The chief manufactures are leather and cotton goods, and machinery. The retail business in 1929 amounted to \$6,309,286. Peabody was originally a part of Salem. Pop. 1920, 19,552; 1930, 21,345.

**PEABODY EDUCATIONAL FUND**, an American foundation created in 1867 by GEORGE PEABODY with gifts amounting to \$3,000,000 for promoting and encouraging intellectual, moral or industrial education among the poor children of the southern and southwestern states. The income only was available. In 1914 the fund transferred to the JOHN F. SLATER FUND all its cash and securities for a foundation to be known as the George Peabody Fund, the income to be used for improving rural schools for the Negroes.

**PEACE**, a status in international law in which nations are not at war. When there is a universal condition of peace, the conditions of war and NEUTRALITY do not exist. It is a desirable condition of international society which much international machinery now seeks to preserve. Such is the object of the HAGUE CONVENTIONS, the LEAGUE OF NATIONS, the PERMANENT COURT OF INTERNATIONAL JUSTICE, the Pact of Paris and the disarmament conferences. See also WASHINGTON CONFERENCE.

**PEACE, BREACH OF THE**, a disturbance of public order by any forcible, unlawful or riotous proceeding. In primitive law in the North of Europe, certain places, certain times and certain persons were exempt from prosecution of the blood feud. In the course of development of English law, they came to be spoken of as in the peace of the King. Thus crimes and offenses came to be spoken of as against the peace and dignity of the King, and by inheritance from England indictments and informations in the United States charge offenses to have been committed against the peace and dignity of the state or Commonwealth or people, according to the style employed in the particular jurisdiction. At common law a peace officer may arrest without warrant where a breach of the peace takes place in his presence, and private persons are privileged to act to prevent breaches of the peace in their presence.

**PEACE CONFERENCES**, conferences held at the conclusion of a war, for the purpose of fixing the terms of PEACE. Full participation is normally limited to the belligerents (*see* BELLIGERENCY) although neutrals may be invited to attend discussions on matters involving their rights or interests. At the Peace Conference of 1919 neutrals were consulted on various matters, but the resultant treaties were drawn up by the victorious belligerents. The defeated powers did not participate, but were invited at the end to make observations before signing the treaties.

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**PEACE MEMORIAL**, an arch built of cement on the Washington-British Columbia boundary near Blaine, Wash., erected in 1922 to commemorate the one hundredth anniversary of peace between the United States and Canada. The arch rides across a frontier where no gun has ever been fired. Above the portal is engraved the motto, "Children of one mother," on one side, and on the other, "No gate will ever be closed here." In the portal on the American side was placed a piece of timber from the *Mayflower* and on the Canadian side a piece of wood taken from the *Beaver*, the first boat propelled by steam in the waters of the north Pacific.

**PEACE OF GOD**. See TRUCE OF GOD.

**PEACE RIVER**, a stream of western Canada, formed by the junction of two forks, the Parsnip and Finlay rivers, in the Rocky Mountains of British Columbia. Following an eastward course, it breaks through the mountains, turns northward, and flows across Alberta to enter the Slave River. Measured from its remotest source, the river is 1,067 mi. long. It is navigable after leaving the mountains. Peace River is a branch of the Mackenzie River system which drains the waters of an extensive area into the Arctic Ocean.

**PEACH**, a deciduous tree (*Prunus Persica*) of the rose family, supposed to be a native of China where it has been cultivated since prehistoric times. Because it reached Europe by way of Persia the Greeks called it *Persikos*; hence its botanical name. When

it develops naturally, old trees sometimes reach 20 ft. in height. In orchard practice its usual height is less than 12 ft., because pruning, spraying or dusting and harvesting are practiced more efficiently and economically with smaller trees. The tree lives only 30 to 40 years, but its duration is usually shortened considerably by insect-injury or diseases. In commercial practice peach trees are generally replaced before the tenth year.

Popularly, peaches are of two classes, freestones and clingstones. The line of demarcation is not well defined because differences of soil and season cause variations even in the same variety. Several thousand varieties have been listed by pomologists but probably less than 300 are grown in American home and commercial orchards. These have been classified in five groups. 1. Peen-to or flat, very early varieties (Waldo), grown in Florida and the gulf states mainly for home use. 2. South China, oval, long pointed varieties (Honey) with a deep suture near the stem and a bitter-sweet flavor which limits their popularity. 3. Spanish or Indian, very late, yellow firm-fleshed varieties (Cabler), also somewhat grown sparingly in the South. 4. North China, large usually cling or semi-cling, white-fleshed varieties (Carman), extensively planted for home and market wherever peaches can be grown. 5. Persian, large cling or free yellow-fleshed varieties (Crawford), usually more tender to frost and less productive than north China varieties with which they have been intercrossed so distinction is difficult.

The leading commercial varieties grown from New York to Michigan and southward to the gulf states are Greensboro, Carman, Belle of Georgia and Elberta. High quality varieties most suitable for home gardens in this area and ripening successively during about two months include the first three just mentioned also Wadell, Rochester, Champion, Fitzgerald, Crawford Early, Crawford Late, Wilma, Chairs and McKay Late. Most of these varieties have small, inconspicuous flowers. Others, as Greensboro, Carman and Waddell, have large, and showy blossoms for which they deserve planting as ornamental trees.

New varieties are produced from seeds, but established kinds are propagated by budding on seedling peach stocks. Peach trees will stand temperatures below zero provided they have ripened their wood and buds properly and also provided long warm spells do not occur during winter or early spring. These tend to start activity, especially of the buds which may be frozen during a later cold snap. Frost during blooming is also destructive of flowers and newly formed fruit.

The trees succeed on almost all well drained soils but especially on sandy loams. Peach trees are often alternated with apple trees in each direction, at 20 ft. intervals. As their usual commercial life is 10 years and as they generally do not crowd the apples, they make good fillers and help to pay the cost of developing the apple orchard.

# PEACH PRODUCTION, U.S.

7-Year Average, 1924-30

Division	Production (Bu.)	% of Total
UNITED STATES .....	54,597,000	100.0
LEADING STATES:		
California .....	20,733,000	38.0
Georgia .....	6,938,000	12.7
New Jersey .....	2,222,000	4.1
Arkansas .....	2,092,000	3.8
New York .....	1,938,000	3.5
No. Carolina .....	1,906,000	3.5

The fruit buds are borne on twigs of the previous season and are conspicuous; it is easy, therefore, by a single pruning operation, to keep the trees within bounds and to reduce the number but increase the size of the fruits. This consists in cutting back these annual growths from one-third to two-thirds in late winter. In the South pruning in summer is also somewhat practiced.

The peach is subject to "yellows," "little peach" and "rosette," all incurable diseases. The only way to prevent their spread is to dig and burn the trees. Brown rot and other leaf diseases are controlled by spraying or dusting with fungicides. Curculio larvæ which destroy the fruit may be killed by arsenical sprays shortly after the fruits have formed. Borers kill more peach trees than all other causes combined. See INSECTICIDES.

M. G. K.

**PEACH MOTH, ORIENTAL**, a moth of the family *Olethreutidæ*, first known in this country about 1913 or earlier, probably introduced from Japan. While it is mainly a pest of the peach, it also attacks quinces, apples, plums and cherries. Injury to these hosts is caused by the larvæ. Early larvæ tunnel in the tips of new growing shoots; later broods attack the fruit, burrowing in the flesh and feeding mainly about the stone. There are several broods each year. The moths are small grayish insects which deposit their eggs on twigs, foliage and fruit. Larvæ of the last brood hibernate in silken cocoons spun in sheltered places. Spraying has not proved a very effective means of control. Paradichlorobenzene used at the bases of trees kills all larvæ hibernating there.

**PEACH TREE BORER**, the most destructive of all the insect enemies of the peach. It is the larva of a clear winged moth (*Sanninoidea exitosa*) of the family *Ageriidae*. It feeds beneath the bark usually at or below the ground surface. Connection is thus destroyed between root and top, thus starving both. Its presence is indicated by gummy exudations filled with frass. Cutting out or suffocating with poisonous gases are the most effective remedies.

**PEACOCK, THOMAS LOVE** (1785-1866), English poet and novelist, was born at Weymouth, Oct. 18, 1785. At 19 he published *The Monks of St. Mark*, which was followed by other volumes of poetry. In 1812 he met PERCY BYSSHE SHELLEY, becoming his friend, and eventually his executor. The first of Peacock's seven novels, entitled *Headlong Hall*, appeared in 1816. It was followed by *Melincourt*, 1817, *Nightmare Abbey*, 1818, *Maid Marian*,

1822, *The Misfortunes of Elphin*, 1829, *Crotchet Castle*, 1831, and *Gryll Grange*, 1860. In these nimble tales, interspersed with poems, the author revealed a whimsical wit and a gift for satire which were new to English literature. His satire, particularly his thrusts at the 19th century "intellectual," was polished but exceptionally keen. His love of the country and his power to describe it are noted, and perhaps are best revealed in *Maid Marian*. The author died at Lower Halliford, Jan. 23, 1866.

**PEACOCK** (*Pavo cristatus*), one of the largest of the pheasants. Distinguished by its striking plumage, especially the fanlike tail coverts, which can be raised to display their characteristic eye-like markings, the peacock has long symbolized vanity. A native of India and Ceylon, in some parts of which wild peacocks still abound, the bird was well known to the ancients. In Greek mythology it is associated with Hera; Solomon is said to have introduced it into Palestine, and the Romans regarded it as a table delicacy. To-day it is bred purely as an ornamental bird.

The peacock's train, the remarkably developed tail coverts, is supported when raised by the true tail feathers, or rectrices. The ordinary peacock has the base of the crest bare, while a second species (*pavo muticus*), of Burma and Java, has the crest feathers barbed to the base. There is also a variation called the Japanese or jappanned peacock, which shows upper wing coverts of a gorgeous blue; the hens of the Japanese fowl have grizzled plumage.

The peacock has a raucous voice, an unfriendly disposition, and has never been completely domesticated. Like other pheasants, it roosts in trees but builds nests on the ground. Closely related pheasants are the argus (*Argusianus*) and peacock pheasants (*Polyplectrum*).

**PEAK TANKS** are located at the extreme forward and after ends of a vessel. The forward peak tank extends from the stern to the first bulkhead, and the after peak tank from the after bulkhead to the stern. The top of the tanks are formed by a water tight flat or deck, and the sides by the ship's hull. Peak tanks are often used for carrying water.

**PEALE, CHARLES WILLSON** (1741-1827), American portrait painter, brother of James Peale, the miniaturist, was born in Queen Anne County, Md., Apr. 16, 1741. After studying for two years under Copley in Boston, he went to London in 1770, and was a pupil of Benjamin West for several years. Returning to America, he established himself as a portrait painter, first in Annapolis and then in Philadelphia. One of his earliest portraits represents Washington in the uniform of a Virginia colonel. Peale served as an officer during the Revolution, and later executed portraits of many of his brother-officers. Of his numerous portraits of Washington, the most admired is in the National Gallery at Washington. In 1805 Peale helped to found the Pennsylvania Academy of Fine Arts. The Academy has the portrait of himself which the artist executed at 83.

Peale died near Germantown, Pa., Feb. 22, 1827.

**PEALE, JAMES** (1749-1831), American painter, brother of Charles Willson Peale, was born at Annapolis in 1749. He served in the Revolution and turned his attention to portrait painting, executing many miniatures and portraits in oil, including two portraits of Washington, one in the New York Historical Society, and the other in Independence Hall, Philadelphia. Peale died in Philadelphia, May 24, 1831.

**PEALE, REMBRANDT** (1778-1860), American portrait painter, was born in Bucks Co., Pa., Feb. 22, 1778. He had his first lessons from his father, Charles Willson Peale, and studied later under Benjamin West in London. He also spent some time in Paris. He is chiefly remembered for his portraits of Washington, one of which is in the Capitol at Washington and one in Independence Hall, Philadelphia. Among others who sat to him were Thomas Jefferson, Dolly Madison, Commodore Perry and Gilbert Stuart. One of the founders of the National Academy of Design, Peale served for some time as president of the American Academy of Fine Arts. He died in Philadelphia, Oct. 3, 1860.

**PEANUT** (*Arachis hypogaea*), an annual plant of the pea family very widely cultivated for its edible seeds yielding a valuable oil. The plant, believed to be native to South America, is now grown in nearly all tropical and subtropical countries. Its much branched hairy stems, 1 to 2 ft. high, bear leaves composed of 4 oval leaflets. The flowers, borne low on stout recurving stalks, soon penetrate the ground where the pod or nut, containing 1 to 3 edible seeds, ripens.

The seeds, after roasting, are used in various ways for food; in tropical countries they are often eaten fresh. They yield from 40 to 50% or more of oil used in numerous food preparations. Peanut culture in the United States is carried on chiefly in Georgia, North Carolina, Alabama and Virginia, which in 1927

#### PEANUT PRODUCTION, U.S.

4-Year Average, 1927-30

Division	Acreage	Production (Lbs.)	% of Tot. Prod.
UNITED STATES . . . . .	1,197,000	847,333,000	
LEADING STATES:			
No. Carolina . . . . .	212,000	208,161,000	24.5
Georgia . . . . .	322,000	207,727,000	24.5
Alabama . . . . .	234,000	134,500,000	15.9
Virginia . . . . .	153,000	127,003,000	15.0
Texas . . . . .	125,000	68,988,000	8.1
Oklahoma . . . . .	43,000	27,212,000	3.2
Florida . . . . .	43,000	25,445,000	3.0

produced 80% of the total crop of 806,990,000 lbs., valued at \$32,501,000. In 1925 the total value of peanut butter produced in the United States was \$6,200,547. The principal countries exporting peanuts are British India, Senegal and China; the chief countries importing peanuts are usually France, Germany, Great Britain, Netherlands and the United

States. Those exporting peanut oil are China, France, Netherlands and Great Britain.

A. B. J.

**PEAR**, a deciduous European tree (*Pyrus communis*) of the ROSE FAMILY grown for its fruit. In temperate climates on congenial soil it often grows from 50 to 75 ft. tall and forms a more pyramidal head than its close relative, the apple. In orchards it is kept at less than 30 ft. to facilitate spraying and harvesting. Under cultivation thousands of varieties have been produced, many of which are of delicious quality and ripen successively during eight or nine months in natural storage. Cold storage can extend this period indefinitely.

About 1840 the Chinese sand pear (*P. serotina*, erroneously confused with *P. sinensis*) was introduced into America as an ornamental. Shortly after it hybridized with dessert varieties and produced several mongrels, two of which have been planted extensively—LeConte in the South, Kieffer in the North. These two varieties have done irreparable harm to American pear growing because during the past two or three generations their low quality has led the indiscriminating public to conclude that all pears are equally disappointing.

European varieties of the pear have accompanied colonization and settlement from New England and Nova Scotia westward to Michigan. In this area they are planted much less than they deserve. On the Pacific coast some of them, especially the Bartlett, have attained considerable commercial importance. They can not be successfully grown in the South or in the rigorous prairie states. In the former the Chinese hybrids rule; in the latter various Russian varieties are planted to a small extent. Among the countless superior European varieties suited to the northeastern quarter of the United States, adjacent Canada and also to the Pacific coast the following are of outstanding merit for home orchards and some of them for market: Elizabeth, Louise Bonn, de Jersey, Anjou, Seckel, Comice, Howell, Flemish Beauty, Lawrence, Clapp Favorite, Bartlett, Beurre Bosc, Beurre Hardy.

#### PEAR PRODUCTION, U.S.

7-Year Average, 1924-30

Division	Production (Bu.)	% of Total
UNITED STATES . . . . .	22,170,000	
LEADING STATES:		
California . . . . .	7,998,000	36.1
Washington . . . . .	2,934,000	13.2
Oregon . . . . .	2,196,000	9.9
New York . . . . .	2,175,000	9.8
Michigan . . . . .	706,000	3.2
Pennsylvania . . . . .	538,000	2.4

Pears are often dwarfed to adapt them to small areas, by grafting or budding the desired varieties on quince roots. Such trees may be kept at almost any desired size and be trained as espaliers or cordons against walls or on trellises. The fruit of some varieties, especially of Duchesse d'Angoulême, so treated is

greatly improved by dwarfing. Pear trees do best in moderately fertile, well-drained heavy clay loams. In rich soil they make sappy growth which is more susceptible than denser tissues to fire blight. (See FUNGICIDES.) Pear diseases of fungous origin may be prevented by spraying or dusting with fungicides. Insect enemies are mostly the same as an apple and may be controlled by the same means. M. G. K.

**PEARL FISHERY**, an industry which involves the taking not only of pearls but also of pearl shell, the world production of the latter being considerably more valuable than that of the former. The oldest pearl fisheries, which have produced the finest pearls of history, are those of Ceylon, India, and the Persian Gulf. Pearls are also found in other tropic waters, including those of the Aru Islands, Sulu Archipelago, Philippine Islands, Red Sea, New Guinea, Australia and the Pearl Islands off Panama. The pearl oyster, *Meleagrina vulgaris*, is the most common variety, but at least 30 other species of *Margaritafera* produce pearls, as well as the huge *Tridacna* clams and several fresh water mussels.

The methods used in the fisheries of Ceylon and the Indian Ocean are typical. Here the season of about five weeks begins early in March. The diving is done in about 40 ft. of water, from small boats of from 12 to 15 tons, several of which usually are accompanied by a mother or store ship. The best divers—Japanese, Filipinos, and Malays—usually work naked except for a belt to which is attached a basket to receive the oysters. A heavy stone is tied to the rope by which the diver is sent to the bottom. Staying under water about a minute, he tears loose from the rocks all the oysters he can reach and places them in his basket. Though these waters are shark-infested, the divers arm themselves only with a knife or pointed stick. Diving continues from sunrise until noon, when the fleet returns to shore and the oysters are sold at auction unopened. The divers usually take a percentage of the oysters as their pay. In Japanese waters, the finest divers are girls, and female Polynesians are said to be more skillful than men.

In shallower waters, it is sometimes possible to use tongs like those used for edible oysters in Chesapeake Bay. In river fisheries the mussels are usually dredged up. See also OYSTER, PEARL.

**PEARL MILLET** (*Pennisetum glaucum*), a valuable food and forage plant of the grass family called also African millet and Indian millet. It is a stout, erect annual, 6 to 10 ft. high, resembling Indian corn in appearance. The conspicuously jointed stem bears narrow leaves, 2 to 3 ft. in length, and a long, dense, cat-tail-like flowering spike. In this is produced the small bluish or whitish grain used for food in warm countries. The parent wild plant is unknown; some authorities regard pearl millet as a cultigen, probably originating from a hybrid.

**PEARL RIVER**, a stream of Mississippi, rising near the northern boundary of Winston Co. in the east central part of the state. The river runs south-

west to the city of Jackson and from there southeast and south, forming part of the eastern boundary of Louisiana before it enters the Gulf of Mexico through the Rigolets. Throughout its course of 350 mi. the stream is narrow and winding, but with high water is navigable for 100 mi. It drains 7,000 sq. mi. of the cotton and sugar cane section of the south.

**PEARLS**, calcareous concretions produced by a number of species of molluscs, owe their value to a characteristic luster and have long been treasured for personal adornment. Fine pearls are exceeded in value only by the best diamonds, emeralds and rubies.

In substance, pearls are similar to the mother-of-pearl lining of mollusc shells. They result from accident or a diseased condition, being formed by the efforts of the mollusc to cover some irritating substance which has entered the shell. In very many cases, this is a dead parasite; in others, a grain of sand or similar substance. Round pearls are formed in the muscles or soft tissues and are therefore not attached to the shell. The so-called button pearl is rounded on top but flat where it joins the shell. Blister pearls form around a parasite which bores through the shell; baroque pearls are irregular, the nacre covering an odd-shaped piece of wood, stone or similar substance.

The perfect pearl, round or pear-shaped, must have a surface free from flaw and of the most delicate texture and "orient." It is almost translucent. Often the outer skin may be peeled from a pearl of imperfect texture, revealing an absolutely perfect skin underneath. The finest pearl known is called "La Pellegrina" and as far as is known is in a museum in Moscow. Said to be of Indian origin, it weighs 28 carats. The largest known is a baroque pearl, 2 in. around in one direction and  $4\frac{1}{2}$  in the other, and weighing almost 3 oz.

Pearls are produced by many tropical molluscs, especially species of *Meleagrina* or *Margaritifera*. The finest pearls and shells have come from *Margaritifera vulgaris*, the pearl oyster of Ceylon and India, Australia, Malay Peninsula and Japan..

River pearls are formed by mussels of both European and American streams. Scotch rivers have produced many fine specimens, and the famous pearls offered to Venus by Julius Caesar were of British origin. Though pearls are found in mussels taken from the Ohio, Cumberland and Mississippi rivers, the shell is of far greater value. American rivers yielded, in 1930, 11,394,000 lbs. of shell, valued at \$245,000. Most shell is used to make pearl buttons, smaller amounts being used in cutlery and for decorative purposes.

Cultivated pearls are true pearls, started artificially. It is said that the Chinese have made these in river mussels since the 13th century. When taken from the water, the shells are gently opened, tiny pellets of metal or bone inserted, and the mussels returned to the water. Small metal images of Buddha are often used, the pearl-covered statuettes having a wide sale. Japan, however, has brought this process to perfection with the pearl oyster. Small round pellets

of mother-of-pearl are inserted and the oysters kept on metal trays in wire baskets for five years or more. The resultant perfect pearls cannot be distinguished from natural ones even by X-rays. Only by bisecting the pearl can the artificial center be found. It is stated that the first process for making artificial pearls was evolved by Jacquin, a French beadmaker, about 1680. He lined hollow glass beads with an iridescent material made from herring scales. A. R. F.

**PEAR PSYLLA**, a minute, dark colored, cicada-like, jumping bug of the order *Homoptera*. It sucks the sap of opening pear buds and foliage and secretes honey-dew. When abundant it kills the new growth, even whole trees and extensive orchards. This is caused partly by its sucking and partly by the honey-dew on which a black fungus grows and prevents the functioning of the leaves. During winter the adults hide in dark crevices. In spring they lay eggs when the buds swell. The young appear about blossoming time and are followed by three or four other broods. Scraping and burning the rough bark and spraying with lime-sulphur solution just as the buds begin to swell will kill the adults and destroy the eggs. Tobacco extract when the blossoms are falling will kill the young.

**PEARSON, RAYMOND ALLEN** (1873- ), American educator, was born in Evansville, Ind., Apr. 9, 1873. He graduated in 1894 at Cornell University. Thereafter he was assistant chief of the dairy division of the United States Department of Agriculture until 1902; general manager of the Walker-Gordon Laboratories, New York, 1902-03; professor of dairying at Cornell University, 1903-08; and commissioner of agriculture for New York State from 1908-12. Pearson was president of Iowa State College from 1912-26, when he became president of the University of Maryland.

**PEARY, ROBERT EDWIN** (1856-1920), American Arctic explorer and discoverer of the North Pole, born at Cresson, Pa., May 6, 1856. He was graduated in 1877 from Bowdoin College (Me.), and in 1881 entered the Navy as civil engineer. Five years later, he made his first journey to the north, exploring the west coast of Greenland and discovering its insularity. He next led an expedition organized by the Philadelphia Academy of Natural Sciences, and explored the Greenland interior. During 1893-95, he made a third trip to Greenland, and in 1898 set out on an extended Arctic expedition, progressing as far north as Lat.  $84^{\circ} 19'$  in 1902. In 1906, he reached Lat.  $87^{\circ} 6'$ , approximately 203 mi. from the pole. Two years later he started on his last expedition. With Matt Henson, a Negro, and four Eskimos, Perry reached the North Pole, Apr. 6, 1909, for which he was elevated to the rank of rear admiral. He died at Washington, D.C., Feb. 20, 1920.

**PEASANT**, a term implying one who cultivates his own land. A peasant is most frequently thought of as a small-scale farmer. The use of the word, however, includes those who do not own their land, but are tenants under the various systems of land-holding



prevailing in the different European countries. Similarly the English yeoman, defined in the narrow sense as a freeholder, includes in the broad sense all small cultivators, whether leasehold or freehold. The English yeoman is in fact the English peasant. In the Middle Ages a peasant was bound to the soil, and achieved complete legal freedom throughout Europe only by the 19th century. The cultivation of land by peasants is opposed to large-scale farming, and the latter has gradually superseded the former as the typical form of cultivation, first in England and later in Europe. Still the peasant exists in large numbers in Europe, particularly in France and eastern Europe. The term has never been applied to small farmers in the United States, perhaps because attachment to the soil has been temporary and free from tradition.

E. W. G.

**PEASANT WAR**, the name commonly but incorrectly applied to the uprisings of 1525 in Swabia, the Rhineland, Austria, the Tirol and Alsace. The root of the difficulty seems to have been twofold: 1. the attempt to carry on under the then existing rural conditions, a way of life developed by the small urban nobility; 2. the introduction of the Roman law. The first placed an impossible strain upon the primitive agricultural methods, extensive in nature and with subdivision into tiny plots. The second had broken down many of the feudal customs which had been a protection not alone to the peasants but to the small rural knights and the poorer classes of the towns. The outbreaks of 1525 were merely the culmination of a long series of disorders and were far from being exclusively the work of the peasants. A large number of the lesser nobility and townspeople joined. A considerable factor in the uprisings was of a religious nature: objections to clerical abuses, particularly hierarchic selection and control of the lower clergy, so that along with demands for the right to kill wild game and obtain a reduction in villein service the peasants coupled insistence on the right of a village to choose its own priest. At first the peasants, through the moderation of their demands and the weakness of the greater nobles, obtained a temporary recognition of their claims. Later, however, more extreme demands were put forward at the same time that the princes of Hesse and Saxony had assembled a powerful army, and the rising was mercilessly crushed at Frankenhausen in the summer of 1525. The movement in the Alps died out of itself.

**PEASE, ARTHUR STANLEY** (1881- ), American educator, was born in Somers, Conn., Sept. 22, 1881. He graduated at Harvard in 1902, took his Ph.D. there in 1905, and in 1905-06 studied classics in Rome. In 1909 Pease joined the faculty of the University of Illinois, where he served in the department of classics until 1924. During the years 1911-24 he was also curator of the Museum of Classical Art and Archaeology. From 1924-27 he was professor of Latin at Amherst, becoming president in the latter year. In Jan. 1932 he resigned the presidency, to take effect in June, to become professor of

Greek and Latin at Harvard. He is the author of a *Commentary on Cicero's De Divinatione*, 1920, 1923.

**PEAT**, an accumulation of dead vegetable matter which is the incipient stage of coal formation. It may vary from a woody, fibrous, light brown mass to a dark brown jelly, according to the amount of decay and compression it has undergone. Ordinary muck at the bottoms of most ponds, swamps and sluggish streams is peat mixed with silt.

When dead plant matter falls beneath fairly stagnant water it is protected from the bacterial action which would ordinarily destroy it. This is because the toxic products of bacterial decay are not removed, and remain to poison and kill the bacteria. In stagnant water, only slight maceration results before the action is stopped. In slightly moving, oxygenated water, decay goes further, and only oily algae, bark, resins, waxes, spores, and seed coatings resist it. Bubbles of inflammable marsh gas, or methane, rising through the water show that decay is going on.

Peat accumulates in bogs and swamps all over the world. In Ireland, Scotland and northern Continental Europe it is sometimes used as a domestic fuel. Large deposits are building up in such swamps as the Dismal Swamp of Virginia and the Sumatra swamps. In order for great thicknesses to form, the land must be slowly sinking and the dead material accumulate so as to provide a root hold for living material at the water's surface. In past geological ages great areas must have been covered with peat swamps in order to have formed the known coal deposits of the world.

About one foot of peat has been observed to accumulate on an average in ten years. Eight feet of new material contracts to about a foot at depth in the bog, so roughly a foot of compressed peat forms in a century. With continued compression it becomes **LIGNITE**, and then **COAL**. See also **ANTHRACITE**; **BROWN COAL**.  
S. F. K.

**PECAN** (*Carya Pecan*), a large species of hickory cultivated in the southern states in numerous selected varieties for its edible nuts, which have become an important article of commerce. It is native to low rich soils, chiefly in the neighborhood of streams, in the lower Mississippi valley from southern Iowa to southern Indiana, southward to central Alabama, Texas and Mexico. The tree, one of the largest of the hickories, grows 100 to 180 ft. high with a massive trunk sometimes 6 ft. in diameter at the enlarged base. When growing in the forest the stout, nearly erect branches form a narrow pyramidal head. In the open this becomes a broad round-topped crown. The oblong, nearly cylindric nut has a fragile shell and thin paper-like partitions enclosing a sweet red-brown seed. In addition to the nuts produced by cultivation, substantial quantities collected from wild trees are marketed.

Pecan growing on a small scale began about 1885. In the South southern varieties have been successful but the orchards are as yet too young to determine the full commercial range of the tree, though the northern limit will probably not extend farther north

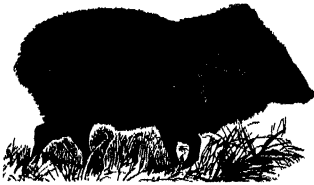
## PECAN PRODUCTION, U.S.

5-Year Average, 1926-30

Division	Production (Lbs.)	% of Total
UNITED STATES .....	49,650,000	
LEADING STATES:		
Texas .....	21,189,000	42.6
Oklahoma .....	6,723,000	13.5
Georgia .....	4,883,000	9.8
Mississippi .....	4,470,000	9.0
Louisiana .....	4,027,000	8.1
Alabama .....	2,414,000	

than southern Pennsylvania, southern Iowa and (with irrigation) California. Though in nature the pecan grows in moist, sandy loams along rivers, experiment has proved that it will succeed in almost any deep, rich well drained soil. As the trees grow slowly and need careful cultivation the cost of their development is often offset or even met by growing peach or other short-lived trees and truck crops in the orchard until the pecans, set usually 60 feet apart, need the whole area.

**PECCARY**, an American wild pig of the family *Tayassuidæ*. The species differ from typical pigs in the number of the toes, in the form of the stomach, in the short tusks, and especially in having a gland in the back which exudes an odorous liquid. The more northerly species, the collared peccary (*Pecari*



COLLARED PECCARY

*angulatus*), roams in forests and thickets from southwestern Texas southward to Central America. It is about the size of a half-grown domestic pig, is compactly built, very agile, and in color is grizzled black and gray, with a whitish stripe on each side of the neck. A larger, more tropical species is the white-lipped peccary. These wild pigs usually travel in bands, are dangerous to any creature that arouses their anger, and are said to drive even the jaguar to take to a tree for safety. E. I.

**PECHENEGS (PATZINAKS)**. A nomadic tribe of Turkish stock, the Pechenegs first appear in the middle of the 9th century residing in the territory between Volga and Yaik north of the Aral and Caspian seas. Disturbed by the pressure of other nomads to their rear, they crossed the Volga toward the end of the 9th century, dislocated the Magyars from the steppes north of the Crimea, and pushed forward as far as the lower Dnieper valley, where they replaced certain Slavic tribes (Ulichians and Tivercians) who had settled there during the period of Slavic expansion. The Pechenegs thus controlled

the lower course of the Dnieper, and were in a position to obstruct Kievan trade with Byzantium. They laid siege to Kiev in 968, ambushed and killed Prince Svyatoslav of Kiev at the rapids of the Dnieper in 971, were successfully held in check by Vladimir I and suffered a crushing defeat at the hand of Yaroslav the Wise in 1034. Thus driven further westward, they crossed the Danube in 1059. After numerous raids into the Balkans, they settled in Greek territory during the last decades of the 11th century, spreading as far south as Philippolis and Adrianople, where they were finally pacified by Alexius Comnenus, 1091.

**PECK**, a measure of dry capacity equivalent to one-fourth of a BUSHEL, used particularly in measuring grains and certain fruits and vegetables. It contains eight dry QUARTS or 537 cu. in. The imperial peck of Great Britain contains 554.48 cu. in.

**PECOS**, a tribe of North American Indians belonging to the Tanoan linguistic stock. In prehistoric times they occupied numerous pueblos of from 200 to 300 rooms in the Pecos River Valley in New Mexico. At the time of the arrival of Coronado's expedition in 1540 they had gathered in one large pueblo, popularly known as Pecos, about 30 mi. southeast of Santa Fe. This pueblo contained between 2,000 and 2,500 inhabitants. It was built on the terrace plan and ruins show that it was composed of two great communal structures of 585 and 507 rooms respectively on the ground floor and was four stories high. A Catholic mission, established at Pecos in 1617, was abandoned in 1782 because of the practical annihilation of the tribe due to warfare and pestilence.

**PECOS RIVER**, a river of New Mexico and Texas, the principal tributary of the Rio Grande. It heads in the mountains above Las Vegas, N.Mex., and flows with increasing fall over the tableland of New Mexico and through a broad valley in Texas. Its junction with the Rio Grande is 36 mi. northwest of Del Rio, Tex. The Pecos is almost 800 mi. long and drains 32,000 sq. mi. of a region partly grazing land and partly devoted to cotton and alfalfa growing. It has a fall of 11,000 ft. The Carlsbad irrigation project has been developed on its course in Eddy Co., N.M. Here the McMillan and Avalon reservoirs store the winter flow of the river and supply water for domestic and stock use and for the irrigation of 25,000 acres.

**PÉCS** or **FÜNFKIRCHEN**, a Hungarian city in the county of Baranya, a seat of a Roman Catholic bishop, of the county, and of the District of Pécs. Among the many educational institutions are the Elizabeth University founded in 1923, a theological seminary and trade schools. An old Romanesque cathedral, two churches which were originally mosques, a subterranean mortuary chapel, and Christian catacombs are located here. Industry includes mills, machine factories and iron foundries, the manufacture of earthenware and furniture, the production of champagne and the fattening of swine. There are large deposits of black coal nearby, part of which

belong to the state and part to a steamship company. The trade is mostly in lumber and swine. One of the oldest Hungarian cities, Pécs was called Sompiana in Roman times and *Quinque ecclesiae* or Five Churches by the Franks. The bishopric was founded in 1009. From 1367-1526 the city was the seat of a university and from 1543-1686 it was under Turkish rule. Pop. 1930, 61,801.

**PECTIN**, a complex body composed of carbon, hydrogen and oxygen, occurring in practically all plants and fruits, and is allied to the plant gums and mucilages. It occurs most abundantly in the apple, quince, currant and gooseberry or berries having firm skins, and appears in small quantities in strawberries, raspberries, etc.

It is responsible for the jelly making qualities of fruits. Three substances are required for the preparation of a jelly—pectin, sugar and acid. These must be present in properly balanced proportions to produce a jelly of the desired firmness. A suitable proportion is 59% sugar, 0.5% pectin and about 0.3% fruit acid.

Pectin is available for the housewife and is a valuable aid in home jelly making. The larger proportion of commercial pectin is extracted from apple pomace. It is also prepared from lemon and orange pulp.

A. W. T.

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**PECTORAL** (Latin *crux pectoralis*, pectoral cross), a cross worn by bishops and abbots at divine service, as well as at other times. It is hung about the neck by a chain or a silken cord, is usually of gold ornamented with jewels and, in the Roman Catholic Church, contains relics. The practice of wearing a cross on the breast dates back to ancient times and extended to the priests and laity. The custom is believed to be derived from the *encolpion*, a little box containing relics and Bible verses, which, in turn goes back to the pagan custom of the *bullae*, a capsule inclosing amulets.

**PEDAL POINT**, in music, a term indicating a long, sustained tone which sounds against a series of harmonies, binding together a chain of chords, or other musical passage. The organ is an instrument to which such a device is particularly adapted, and since the sustained tone is commonly held by one of the organ pedals, organ point and pedal point are synonymous. The significance of the word "point" is explained in the article on COUNTERPOINT. Occasionally the sustained tone is sounded in the treble, while the series of harmonies is placed beneath it; in this case it is called an inverted pedal point or inverted organ point. Any tone in the scale may be thus sustained, but commonly it is the tonic or dominant, the key note or the fifth higher, respectively.

**PEDICULOSIS.** Lice, or pediculi, are insect parasites which live on the body of a human host. A person becomes infested with lice by contact with another person who has them. The lice lay their eggs upon the body hairs or in the underclothing, and multiply rapidly. The bites and movements of the lice

cause itching. The skin is scratched and becomes irritated and inflamed.

There are three varieties of lice: head lice, body or clothing lice, and pubic lice. Head lice are more or less prevalent among school children. The lice lay their eggs upon the hairs of the head. The eggs are easily seen and appear like grains of sand. The eggs are firmly glued to the shaft of the hairs. Pubic lice live and lay their eggs about the hairs in the genital region and cause itching in this area.

Head lice and their eggs may be killed by soaking the head with coal-oil or with a 2½% solution of phenol in water. Pubic lice may be treated similarly or with various ointments. In treating body lice, all the clothing must be sterilized, the body thoroughly bathed and the pubic hair shaved off. Many other preparations are also used for killing lice and nits.

W. I. F.

**PEDIMENT**, in classic architecture, primarily a gable end above an entablature and below a sloping cornice which borders its upper sides, thus enclosing a central triangular space called the tympanum; more generally, any decorative form similar in shape and treatment. In the typical classic pediment, the topmost CORNICE member, the cymatium, carries up the slopes, but not across the horizontal entablature under the pediment, thus giving an effect of subtle unity. The Romans, and the Renaissance designers following the Roman precedent, gave great importance to pediments both decoratively and structurally, frequently using them against a wall over niches, or to form, with the columns that supported them, recesses for statues, and using often segmental curved topped as well as pointed triangular shapes.

During the Baroque period (*see* BAROQUE STYLE) the pediment form was altered in many ways, by breaking back the cornice moldings into successions of receding planes, by omitting the topmost central



PEDIMENT OF SANTA MARIA DELLA PACE,  
ROME  
Designed by Pietro da Cortona

portion of the raking cornice to form the broken pediment, and in addition to this often curling the ends of the remaining portion into spiral scrolls, the scrolled pediment. Often several types of pediment, one within the other, were combined. Sometimes the ends of the broken pediment are so far removed from each other that any resemblance to the gable shape disappears, and the pediment forms remaining become

just one more of many ways of using architectural forms for free decoration.

In the ancient Greek and many Roman examples, the pediment was the position for the most important exterior sculpture. Without such sculpture the tympanum of a large pediment, so strongly framed by the heavy shadows of the raking cornices, seems empty. In many Renaissance and Baroque pediments, scrolled shields or other rich decorative elements fill the tympanum.

**PEDRO I** (1798-1834), first Emperor of Brazil, was born at Lisbon, Oct. 12, 1798. He was the second son of John VI of Portugal. In 1807 the Portuguese royal family fled to Brazil because of the invasion of Napoleon. They returned in 1821, leaving Dom Pedro (*see* PEDRO II) as Regent. He declared the independence of Brazil and was crowned Emperor, Oct. 22, 1822. At first he was exceedingly popular, but due to his dynastic foreign policy and disregard of constitutional limitations, was forced to abdicate, Apr. 7, 1831. He died in Lisbon, Sept. 24, 1834.

**PEDRO II** (1825-91), second Emperor of Brazil, was born at Rio de Janeiro, Dec. 2, 1825. He was the son of PEDRO I, who abdicated in his favor Apr. 7, 1831 when he was but five years of age. His minority was a period of great political disorder, but after 1850 his reign was celebrated for cultural and civic progress in Brazil. In 1871 a law was passed by Parliament for the gradual emancipation of slaves. A law of 1888 for the immediate abolition of slavery helped to precipitate a republican revolution, and Pedro was forced to abdicate in Nov. 1889. He died in Paris, Dec. 5, 1891.

**PEEDEE RIVER**, a river of North and South Carolina, starting in Montgomery Co., North Carolina, as a continuation of the Yadkin. The Peedee enters South Carolina at the boundary line between Chesterfield and Marlboro counties and flows slightly southeast to enter the Atlantic Ocean through Winyah Bay. Its course is through the Piedmont region and the Atlantic coastal plain, a country devoted to cotton and tobacco growing. A short distance above its mouth the river receives the Little Peedee and the Waccamaw from the east and the Lynches River from the west. The combined length of the Yadkin and Peedee is about 300 mi., of which 100 mi. is navigable.

**PEEKSKILL**, a village in Westchester Co., southeastern New York, situated on the eastern shore of the Hudson River, 40 mi. north of Manhattan. It is served by the New York Central Railroad and river craft. The Bear Mountain Bridge spans the Hudson near this point. Dairying and poultry farming are the leading interests of the countryside. Peekskill has iron foundries, machine shops and various factories producing stoves, hats, underwear, yeast and other products. In 1929 the manufactures were approximately \$6,000,000; the retail trade reached a total of \$13,300,511. It is the seat of several private schools. Jans Peek, a Dutchman, established a trading post at an early date on the nearby creek or kill. The settlement sprang up about 1760; the village was incor-

porated in 1816. Robinson House in the vicinity was the headquarters during the Revolution of Israel Putnam and Benedict Arnold. The State Military Camp is just north of Peekskill. Pop. 1920, 15,868; 1930, 17,125.

**PEEL, SIR ROBERT** (1788-1850), British Prime Minister, was born at Chamberhall, Lancashire, Feb. 5, 1788. He was son of a cotton manufacturer who became a baronet in 1800, was educated at Harrow and took a "double first" at Oxford. He was only 21 years old when he entered Parliament and, in 1812, he became Chief Secretary for Ireland, where for six years, he was known by the Roman Catholics as "Orange-Peel." In 1822, he was appointed Home Secretary and, in that office, he reorganized the London Police who, to this day, are called "Bobbies." In 1827, Peel refused to serve under Canning as Prime Minister, but, despite his reputation as a Protestant, he joined with Wellington two years later in granting Catholic Emancipation to Ireland. When William IV dismissed Melbourne in 1834, Peel became Prime Minister for a few months; and, for years afterwards, it seemed as if he would have a second term of office. But Queen Victoria, in her partiality to Melbourne who had been defeated, would not submit to Peel appointing her ladies of the bed-chamber, and Peel refused the Premiership. In 1841, Melbourne's government was defeated in the Commons by one vote and, at a General Election, the Conservatives, led by Peel, were returned with a majority of 91 votes. The party was Protectionist but the prevailing distress, aggravated by the potato famine in Ireland, forced Peel in 1846 to propose the abolition of the Corn Laws. With his party split on this issue, Peel resigned. In June 1850 he was thrown from his horse and fatally injured. He died in London July 2nd. His youngest son, Arthur Wellesley Peel, earned great fame for his dignity as Speaker of the House of Commons, 1884-1895.

**PEELE, GEORGE** (1558-c. 1597), English dramatist, was born in London about 1558. He was educated at Christ's Hospital, and entered Oxford in 1571 and graduated in 1579. His dissolute behavior caused his expulsion from Christ Church. He then went to London, 1580, and became actor and playwright. His *Araygnment of Paris*, 1584, was played before Queen Elizabeth, probably in 1581. *Edward the First*, 1593, was one of the first English historical plays. David and Bethsabe, 1599, is considered by some his masterpiece. Peele wrote the Lord Mayor's pageant in 1585, and another, *Decensus Astraea*, in 1591. Meres speaks of his death before 1598, but the memory of the merry university wit survived in *The Jest of George Peele*, 1607.

**PEEPUL**, the Hindu name (*pipal*) for the sacred Fig or bo-tree (*Ficus religiosa*), a native of India, closely allied to the banyan. The peepul is highly venerated by the Hindus. *See* Ficus.

**PEERAGE**, a name applied collectively to the members of the nobility in England, which comprises dukes, marquesses, earls, viscounts and barons. It in-

cludes both ecclesiastical, or temporal, and secular dignitaries. Peerage is generally hereditary and usually conveys a seat in the House of Lords (*see* PARLIAMENT), but that does not hold in the case of those who are created peers for their natural life only. In addition to a voice in government the peers have the right of trial by their equals or peers, and there have been many cases where the decisions of courts not composed of peers have been held void. In Scotland and Ireland systems of peerage fundamentally similar to that of England exist. Peerage also prevailed on the Continent from time to time but never reached the might of that in England. In France, a House of Peers existed from 1814 to 1848. Peerage in England had its origin in the feudal system when it became the practice of the king to summon his tenants-in-chief to court for consultation on governmental matters such as taxation. Summonses were sent in the form of writs and the chief tenants thus became distinguished from the other representatives summoned by the sheriff. The chief tenants were early known as barons and peerage formerly bore the name baronage.

**PEER GYNT**, a poetic drama by HENRIK IBSEN, often called "the Scandinavian *Faust*." Published 1867, it was produced at the Christiania theater with Grieg's incidental music in Feb. 1876. The irresponsible dreamer, Peer, has many fantastic adventures with people and strange spirits in the mountains around his home, and, at the death of Asa, his mother, he forsakes Solveig, his wife, and plunges recklessly into the world outside, and there finds adventures equally fantastic. Cherishing the motto "To thyself be sufficient," this Ibsenesque individualist blunders through life with a wild prodigality, discovering in his errors the symbols of the truth of the world and of his soul. At last he returns to his upland home, to die dramatically in a great avalanche. Grieg has composed a *Peer Gynt Suite* based on various themes in the drama.

**PEGASUS**, in Greek mythology, a winged horse which sprang from the body of MEDUSA when PERSEUS cut off her head. At a blow from the horse's hoof the fountain of the MUSES, Hippocrene, sprang into existence. Pegasus, while drinking at the spring of Pirene, was caught by BELLEROPHON with a golden bridle given him by ATHENA. On the steed he conquered the CHIMERA and later tried to fly to heaven, but fell off. Pegasus went on alone, remaining in the sky among the stars. In later legend he is said to be the horse of the Muses.

**PEGASUS** (gen. *Pegasi*), the winged horse of the Greeks, a large constellation visible in the autumn. Four of its bright stars form the great Square of Pegasus, that dominates our southern skies during early October and November evenings. The northeastern corner of this square, Delta Pegasi, forms also part of Andromeda as Alpha. Pegasus contains a number of double stars, among which may be mentioned Kappa Pegasi in which the two components are each from 10 to 16 times as bright as the sun, and revolve around each other in 11 years at a distance of about 1 billion

miles. The brighter of the two is a double star. *See* STAR; *map*.

**PEGGING THE EXCHANGE.** The standard monies of the leading financial and commercial nations have the common characteristic of being of GOLD, normally subject to free coinage, with full LEGAL TENDER power at substantially bullion value. So long as these attributes exist, the mint par, i.e., the relative contents in pure gold of the monetary units of any two gold standard countries will serve as the fundamental regulator of exchange fluctuations between the two currencies. Once the fluctuation has reached the gold point or difference at which it is possible to pay the shipping, insurance and incidental costs of shipping gold and absorb the loss of interest on the use of the gold while in transit, the possibility of profitably transmitting it from one country to the other for the purpose of melting and reminting acts as a peg or brake to a wider variance.

In normal times countries which do not want to lessen their gold reserves are usually able to keep the exchange rate within the gold point by such expedient as the elevation of the discount rate. In abnormal times countries sometimes suspend the free coinage of gold. To supply stability to such a currency, the government concerned may arrange a foreign loan or stabilization credit, and by utilizing the proceeds of the loan to bid freely for all of its exchange offered at an agreed rate, thus peg or fix its exchange value at that rate. *See* also EXCHANGE, FOREIGN. W. W.

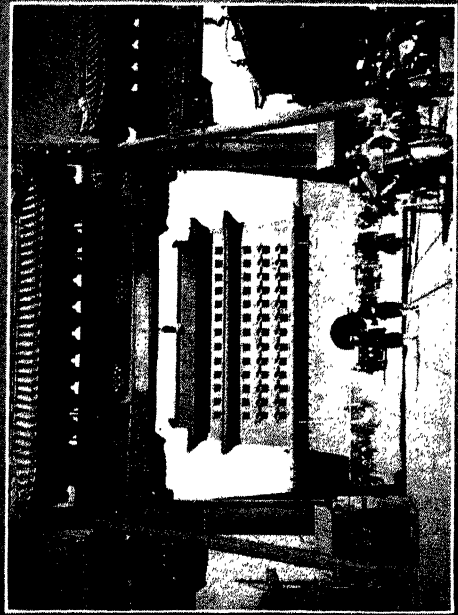
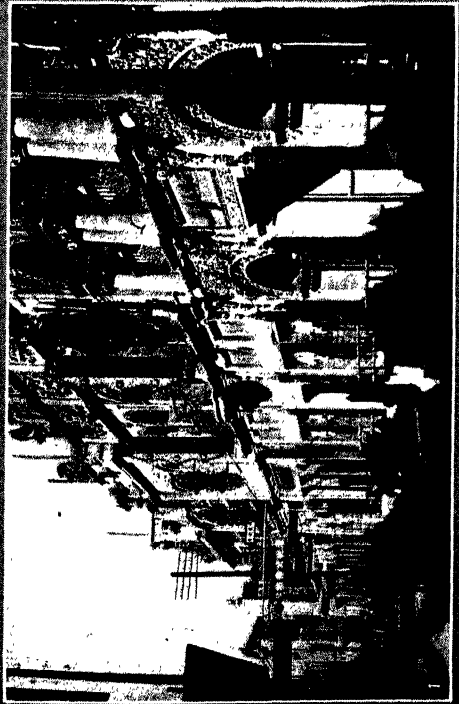
**PEGMATITE**, an IGNEOUS ROCK of remarkably coarse crystallization. Quartz and feldspar crystals in pegmatites may occur several feet in length; apatite in broom-handle like rods; mica, in plates several feet in diameter, and other minerals in like dimensions. The huge crystals are due to the presence of much water, fluorine, boron and other rarer substances in the molten MAGMA from which the pegmatite formed. These substances served to keep it liquid for an abnormally long time, thus permitting large crystals to grow.

In mineral composition, pegmatites may belong to any of the major igneous rock groups. Those approaching the granites frequently contain unusual minerals, and may be mined for their feldspar, apatite, tourmaline, topaz, fluorite, mica, beryl or spodumene, for example. The pegmatites are not unusual in areas which have been intruded by igneous masses. *See* also PETROLOGY.

**PÉGUY, CHARLES** (1873-1914), French author, was born at Orléans in 1873. His beautiful and chivalric character was unspoiled by poverty, hunger and endless struggles. Ardent Catholicism afforded him some consolation, although marriage with a Free-thinker debarred him from the practice of his faith. He wrote exquisite verse, but heavy prose. He is best known as founder of *Les Cahiers de la Quinzaine*, a periodical begun in 1900. Péguy was killed at the Battle of the Marne, Sept. 5, 1914.

**PEIPING**, or *Peking*, the most famous city of China, and capital through much of its history until 1928. It is situated on the northern juncture of the

# PEIPING



## STREET SCENES IN PEIPING (PEKING), CHINA

1. Theatre Street, the Broadway of Peiping. 2. Funeral Procession.
3. Ming Street with the White Ming Pagoda in the background. 4. Private apartment of the late Empress Dowager, within the precincts of the Summer Palace in the Forbidden City.



dusty plain of Hopei Province, beside the war-beaten path from Mongolia. The city, glamorous from its history and remarkable wealth in art, preserves to the present day the atmosphere of royal splendor. Lavish marble bridges, the shining yellow tile roofs of the Forbidden City and the royal palaces, the luxury so disseminated that it shows on the intricate brass work of everyday rickshas, and the long, perfectly proportioned vistas of the city, all re-enforce the impression of ancient culture and prodigal gestures described by Marco Polo in his travels. Peiping is connected by the Grand Canal with the Pei River, water outlet of the province, and by railroad with Tientsin, Shanghai and Hankow, as well as Manchuria and the Northwest. From its position in relation to Mongolia and Manchuria it has always stood as a trade, as well as a war, entrance into China. The flaring curved roofs of Peiping and its wide streets make it seem like a city of solidified tents and as nomadic as the many picturesque traders who travel by cart and horse into town.

As a result of the siege of the foreign legations in Peiping at the time of the BOXER UPRISING in 1900, foreign nations secured the right to maintain troops in the city and along the railways connecting Peiping with the sea. These legation guards still remain at Peiping. When the Nationalists captured Peiping in the summer of 1928, they immediately transferred the capital and the center of government to Nanking, and at the same time changed the name of Peking, which means "Northern Capital," to Peiping, which means "Northern Peace." The transfer of the capital was a serious economic blow to Peiping, and since that time the population has decreased from about 1,000,000 in 1927 to 750,000 in 1930.

Although Peiping has lost its importance as a political center, it remains the cultural and tourist center of China. Special emphasis is now being put on its development in these directions. The American Boxer Indemnity College (Tsinghua College), and one of the leading missionary schools (Yenching University) are located at Peiping, in addition to the National University and five other special government schools of college rank. The Rockefeller-endowed Peiping Union Medical College is also in Peiping.

Peiping is important as a fur trading and carpet manufacturing center. It formerly was the most important city in China for jade, embroideries, jewelry and art works of all kinds, although much of this latter business has moved to Shanghai and Nanking since the transfer of the capital.

The present Peiping is on or near the site of a city started as long ago as 1100 B.C., when the town of Chi, capital of one of the feudal kingdoms, was located here. Cities were destroyed and rebuilt on the site several times in subsequent centuries. Kublai Khan laid out a city along practically the present lines to replace that destroyed by him in 1213. When the Ming Dynasty moved its capital from Nanking to Peking, the city was again reconstructed, this time

in its present form. The Manchu dynasty made minor additions and improvements, particularly in the palaces of the Forbidden City. The Republican authorities have thrown portions of the Forbidden City open as public parks, and have transformed the rest into a national museum. Among the notable sights of Peiping, in addition to the buildings of the palaces in the Forbidden City, is the Altar of Heaven, made of pure white marble and rising in a series of broad steps to a platform open to the sky. This is one of the most beautiful and impressive architectural creations in the world. The city also abounds in splendid temples of architectural and historical interest. Within easy distance are the Great Wall, the Ming Tombs and the Western Hills with their multitude of beautiful temple-monasteries.

**PEIRAIEUS.** See **PIRAEUS**.

**PEIRCE, BENJAMIN** (1809-80), American astronomer and mathematician, was born at Salem, Mass., Apr. 4, 1809. From 1831 until his death he taught mathematics at Harvard. He published a number of mathematical and astronomical papers and some text books on these subjects. Peirce died at Cambridge, Mass., Oct. 6, 1880.

**PEIRCE, CYRUS** (1790-1859), American educator, was born in Waltham, Mass., Aug. 15, 1790. He graduated in 1810 at Harvard, where he returned two years later to study for the ministry. After completing these studies he taught for three years at a private school in Nantucket, resigning to enter the ministry at North Reading, Mass., in 1818. In 1826 Peirce returned to teaching and for four years conducted a school in North Andover before returning to Nantucket in 1832. His success as a teacher attracted the attention of Horace Mann, then Secretary of the Massachusetts Board of Education, who selected Peirce as the first principal of the first Normal School established in the United States at Framingham, Mass., in 1839. The results he obtained in this experiment proved the value of normal training and led to the opening of similar schools. Peirce died in 1859.

**PEISISTRATUS** (c. 605-527 B.C.), Athenian statesman. Profiting by the division of the Athenian people into three great factions, the *Palin*, the *Shore*, and the *Hill*, he led the *Hill*, which was largely composed of poor farmers. In 560 B.C. he made himself master of Athens, seizing the Acropolis and providing himself with a bodyguard, thus becoming what the Greeks called a tyrant, or ruler whose power had no constitutional basis. Holding this position except for two short intervals continuously until his death, Peisistratus secured for Athens a conspicuous position in Greece and the Aegean by means of alliances and extended commercial relations. At home his policies were beneficent, largely directed to relieving poverty and distributing the financial burdens as widely and fairly as possible among all the citizens. Peisistratus fostered the arts, being a great builder. From his time moreover, Athenian literary preeminence dates. His sons Hippias and Hipparchus succeeded him in the tyranny.



**PEKEA NUT**, the edible oily nut of a large South American timber tree (*Caryocar butyrosomum*) of the caryocar family, allied to the souari-nut. The tree bears opposite leathery leaves composed of 3 to 5 digitate leaflets and a drupe-like fruit containing a hard stone or nut and very large seeds.

**PEKIN**, a city of north central Illinois and county seat of Tazewell Co., on the Illinois River, 10 mi. south of Peoria. Numerous railroads serve the city, which is an important shipping point for grain and agricultural produce of the vicinity. It manufactures corn products, yeast, alcohol, leather goods, pipe-organs, and farming implements. In 1929 the value of the factory output was about \$31,000,000; the retail trade amounted to \$8,362,549. There are coal deposits in and around Pekin, and also mineral springs in Mineral Springs Park. The town, organized in 1829, was incorporated as a city in 1849. Pop. 1920, 12,086; 1930, 16,129.

**PEKING**, until 1928 the name of the capital city of China. See PEIPING.

**PELAGIA, ST.** (4th century), a Christian maiden of Antioch in Syria, who was martyred under Diocletian. She preferred death by suicide to dishonor, and she has been lauded in sermons by St. Ambrose and St. Chrysostom.

**PELAGIA, ST.** (5th century), was a native of Antioch in Syria. She was a famous and beautiful dancer of her day, who suddenly repented of her evil life and became converted to Christianity. She passed her remaining years as a hermit on Mount Olivet. She probably died in 457; her feast day is Oct. 8.

**PELAGIANS**, a sect named after Pelagius (fl. 405-420), a British monk and theologian. Pelagius went to Rome at the beginning of the 5th century and there became acquainted with Coelestius, his later disciple. According to the teachings of Pelagius, Adam was not born immortal; his sin was personal and did not affect the human race, which view constituted a denial of original sin; salvation can be reached through the human will, in contrast to Augustine's view of salvation through grace alone. His maxim was "If I ought, I can." Pelagianism was condemned by the council of Carthage in 418 and by the Third Ecumenical Council at Ephesus, 431.

**PELAGIC LIFE**, the life existing in open oceans, either at the surface or at great depths. See MARINE LIFE and DEEP-SEA LIFE.

**PELAGIUS**, name of two popes: Pelagius I, 555-561, was sympathetic to the beliefs of the Byzantine Church and was repudiated by the bishops of Italy. Pelagius II, 579-590, of Gothic origin, sent the later Gregory the Great to Constantinople to procure support against the Lombards.

**PELARGONIUM**, a numerous genus of South African herbs and subshrubs of the geranium family. There are upwards of 230 species, many of which are widely grown for ornament yielding the well known geraniums of the gardener and florist. They differ from the true GERANIUM chiefly in their irregular flowers, which are provided with a spur. A large

number of hybrids and cultigens derived from various species have resulted from the long and extensive cultivation of these popular plants. Among them are the show or fancy geraniums (*P. domestica*) exhibiting a wide range of brilliant colors, such as the Lady Washington geraniums, grown as pot plants. Other well known pot and garden plants are the ivy geranium (*P. peltatum*), a weak trailing plant; the fish geranium (*P. hortorum*), grown in the open in California; the nutmeg geranium (*P. odoratissimum*), with fragrant foliage, and the oak-leaved geranium (*P. quercifolium*), an old garden plant.

**PELEG**, according to the BOOK OF GENESIS (10: 25), the first of the two sons of Eber, his brother being Joktan. Peleg means division, and the author adds in explanation, "for in his days was the earth divided," an allusion to the division of mankind into different races. Joktan is made the ancestor of 13 tribes in southern Arabia. Peleg becomes the father of REU and the grandfather of SERUG, and thus an ancestor of ABRAHAM and the Jews.

**PELEUS**, in Greek mythology, son of AEACUS and Endeis and brother of Telamon. The king of Phthia gave Peleus his daughter ANTIGONE in marriage, and with her a third of his kingdom. Peleus accidentally killed the king, Eurytion, and fled to Iolcus, where he married the Nereid THETIS and became the father of ACHILLES.

**PELHAM**, a town including the incorporated villages of Pelham, Pelham Manor and North Pelham, situated in Westchester Co., southeastern New York. The villages are residential suburbs of New York City and are served by bus lines, the New Haven, and Boston and Westchester railroads. Pop. of town, 1920, 5,195; 1930, 11,851.

**PELIAS**, in Greek mythology, son of POSEIDON and Tyro, and twin brother of Neleus. The brothers were brought up by shepherds, but on the death of the king of Iolcus they seized the throne. Pelias soon drove out his brother, and when JASON came to claim the kingdom, Pelias got rid of him also by sending him to fetch the Golden Fleece from Colchis. When Jason returned with MEDEA, she told the daughters of Pelias, the Peliades, that they could restore their father's youth by cutting him in pieces and boiling them in a cauldron, which they did.

**PELICAN**, the common name for a family (*Pelecanidae*) of large aquatic, fish-eating birds of very curious appearance. There are 10 known species widely distributed in tropical and temperate regions, three of which occur in North America. Pelicans are of very large size, ranging from about 4 to 6 ft. in length, with short legs, all four toes joined by webs, and exceedingly large powerful wings often with a spread of 10 ft. From the under side of the enormous bill is suspended a huge elastic pouch used as a scoop net to catch fish. Pelicans nest in colonies, usually on an island, erecting for a nest a rude heap of sticks and rubbish and laying 1 to 4 pure white eggs. The young subsist upon food which they find for themselves in the throats of their parents.

The North American species include the American white pelican (*Pelecanus erythrorhynchos*), one of the largest and most handsome of our native birds, found chiefly in the interior nesting from Minnesota to northern Saskatchewan; the brown pelican (*P. oc-*



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BROWN PELICAN

*cidental*is), breeding in large numbers on the Florida Gulf coast and the California brown pelican (*P. o. californicus*), ranging on the Pacific coast from British Columbia to the Galapagos islands. A. B. J.

**PELICAN FLOWER** (*Aristolochia grandiflora*), a highly ornamental greenhouse climber of the birthwort family, native to Jamaica. It is a smooth shrub bearing heart-shaped leaves and conspicuous, somewhat pipe-shaped, purplish flowers, 6 in. broad, provided with a tail in some varieties 3 ft. long. This peculiar plant is closely allied to the calico-flower, native to Brazil, and to the DUTCHMAN'S PIPE, found in the eastern United States. See also ARISTOLOCHIA.

**PELION**, a mountain range on the east coast of Thessaly, Greece, below Mt. Ossa. On its summit was a temple to Zeus, or Jupiter. The region is full of Greek myths, one being that the giants piled Ossa and Olympus on Pelion, or Pelion and Ossa on Olympus, in order to reach heaven. The Centaur Chiron was said to have a cave near the summit, and from Pelion the lumber was brought for the ship *Argo*.

**PELLAGRA**, a disease arising from faulty nutrition, involves the skin, gastro-intestinal tract and nervous system, the principal distinguishing features being an inflammatory condition of the mouth and tongue and a characteristic skin eruption. In severe or neglected cases, marked diarrhea, extreme weakness, and a mental disturbance manifested by depression, fear and apprehension are frequently observed.

The condition was first described in 1735 by Casal, a Spanish physician, among the natives of Northern Spain. Soon after the publication of Casal's observations it was found to be endemic in most of Southern Europe and in Egypt. It has since been reported from every country in the World. Though sporadic cases had previously been reported, its presence in the United States in endemic form was not recognized until 1907, when Searcy called attention to its prevalence at the Tuscaloosa (Alabama) State Hospital for the Insane. Following this report, it was found to be more or less common throughout much of the rural South. It is now reported from every State in the Union, but the rural population of the cotton belt, including the smaller and more isolated rural industrial communities, furnishes most of the cases observed in this country.

It may appear in all walks of life and under urban as well as rural conditions. However, the endemic disease is essentially rural and is closely and intimately bound up with rural poverty, especially that variety of poverty which more directly influences the character of the dietary. Its incidence is, therefore, quickly and profoundly influenced by shifting economic and dietetic conditions. It is predominantly a seasonal disease. The vast majority of cases occur during late spring and early summer (April, May and June), the symptoms tending to disappear as the season advances, frequently to recur the following spring.

Though known for nearly two hundred years, the nature of its cause has, until recent years, remained in obscurity. Most observers early recognized the singular importance of a nutritious diet in its treatment, but it was through the researches of the late Joseph Goldberger, of the United States Public Health Service, that the cause has been made clear and practical and effective measures for its treatment and prevention established. He and his associates established the fact that pellagra is caused by an unbalanced diet, and that the fault is an inadequate supply of an essential food element, which has been designated Vitamin G, or the antipellagragic vitamin.

Fresh lean meats, liver, milk, salmon, tomatoes, and turnip greens have been found to supply the antipellagragic vitamin in considerable quantity. Commercial wheat germ and dried yeast are rich in it, the latter being its richest known source. Eggs, haddock, dried peas, soy beans, dried milk, and spinach possess it, but to a less degree. Corn and corn products, wheat flour, rye flour, oatmeal, salt pork, lard, cottonseed oil, cod-liver oil, butter, carrots, rutabaga turnips, sweet potatoes, mature onions, and cane syrup have been found to be poor sources of this factor. See also VITAMINS.

G. A. W.

**PELLÉAS ET MÉLISANDE**, an opera in five acts by CLAUDE DEBUSSY, libretto by MAURICE MAETERLINCK; première, Paris, 1902, New York, 1908. It is the most important of Debussy's dramatic compositions, and by some critics is considered the most important French composition of the 19th century. Maeterlinck's play of the same name proved too long and

too diffuse for the composer's purpose; consequently it was cut by Debussy, greatly to the indignation of the author. However, its unique atmospheric charm cannot be said to have been damaged by Debussy who brought to the amended text an exquisite musical imagination.

While wandering through the forest, Golaud, half-brother of Pelléas and grandson of Arkel, King of Allemonde, comes upon a princess. Her royal costume is in tatters, her coronet has fallen into the well, and she is weeping. Refusing to tell Golaud where she comes from, she agrees to accompany him to his castle where he lives with his half-blind grandfather, Arkel, and his mother and child (by a dead wife), Genoveva and Yniold respectively. Six months later, having meanwhile married Mélisande and taken her away on a journey, Golaud writes home asking Pelléas to plead his cause with King Arkel who had planned a different union for him. He wishes to bring his bride to the castle. In this King Arkel acquiesces, and the couple return home in due order. But Golaud is presently on the hunt again, and Pelléas, often alone with the hauntingly exquisite bride of his half-brother, falls in love with her. One day, alone together in the park, Mélisande, playfully tossing her wedding ring into the air, lets its fall into a pool while Pelléas watches her. They are unable to recover it, and when Golaud notices its absence from his wife's finger he is told that the ring was lost by the sea. Instructed to fetch it at once in the company of Pelléas, Mélisande and he go forth, not at all loath, into the moonlight. Conscious of his growing love for Mélisande, Pelléas repeatedly announces that he is going away on a journey. But already he is caught fast, in his love for the fair Mélisande, and Golaud's suspicions mount daily. Wracked by jealousy, Golaud at last spies on Pelléas and Mélisande, and holds up his little son, Yniold, at his wife's window. What the lad sees confirms Golaud in his decision to secure vengeance. When he comes upon the pair, surprising them in an embrace, the maddened Golaud strikes down Pelléas, who falls dead while Mélisande flees in terror. In her delirium she gives birth to a daughter. The infant dies, and her own hours are numbered. But Golaud, tortured by doubt, cannot resist torturing his wife with questions. She had loved Pelléas, surely, but had that love betrayed their own marriage? She makes denial, but he presses the question until, at length, Mélisande no longer can deny. At her side Golaud collapses, sobbing.

**PELLICO, SILVIO** (1788-1854), Italian writer and patriot, was born at Saluzzo, Piedmont, June 24, 1788. After some preliminary teaching he composed *FRANCESCO DA RIMINI*, 1818, a tragedy much admired for its patriotic tone. He then edited the *Conciliatore*, a journal of opposition to Austrian rule. Accused of Carbonarism, he was imprisoned. On his release, he wrote his famous prison memoirs, *Le Mie Prigioni*, published 1832, a masterpiece of its kind that struck a mortal blow at Austrian power. Pellico died at Turin, Jan. 31, 1854.

**PELOPIDAS** (d. 364 B.C.), Theban general. Together with Epaminondas he played an important part in securing the short-lived supremacy of Thebes in Greece. In 379 he expelled the Spartan garrison from Thebes. At the battle of Leuctra in 371 he commanded the Sacred Band of Thebes with skill and daring. After expelling Alexander, tyrant of Phærae, at the request of the Thessalians in 369, he interfered in a dynastic dispute in Macedonia, bringing the young Philip, later the conqueror of Greece, as a hostage to Thebes. Pelopidas died in a victorious battle with Alexander of Phærae in 364 B.C.

**PELOPONNESIAN WAR**, a war between Athens and Sparta, attended by their respective allies, 431-404 B.C. Each state stood for a political principle intolerable to the other. Athens supported democratic government, liberal manners and free trade; Sparta was oligarchic, conservative and agricultural. At first the Athenians remained on the defensive, suffering almost yearly invasions of their territory, meanwhile employing her superior navy to isolate the Peloponnese. After 10 exhaustive years a truce, the Peace of Nicias, was concluded. At length Athens attempted a daring expedition against Syracuse, a Corinthian colony in Sicily, and its disastrous failure, 413 B.C., foretold the end. A naval defeat off Arginusæ, 406 B.C., involved a disgrace so severe to the admirals in command that it has been blamed for the final catastrophe off Aegospotami, 404 B.C. Sparta dictated a peace providing that Athens level her walls and institute an oligarchy, neither of which provisions could be long enforced. The war left Greece without a leader, and may be said to have prepared the way for Macedonian supremacy.

**PELOTAS**, a city of Brazil, situated in the state of Rio Grande do Sul about 29 mi. northwest of the city of Rio Grande, with which it is connected by railroad. The River São Gonçalo flows near by and connects Pelotas with the waterways of the interior. The jerked-beef industry is carried on extensively, there being many packing houses located here. Pop. 1920, 82,294.

**PELVIS**, a bony ring at the lower end of the trunk serving as the support of part of the organs of the abdomen, and as a firm base for the attachment of the legs.

In the adult the pelvis is formed almost entirely of three bones; the sacrum and the two hip-bones. The sacrum, formed by the fusion of five vertebrae, constitutes the keystone and the connection with the spinal column. The hip-bones are broad, curved, oblique plates, forming the side walls, each of which has a deep depression into which the head of the thigh-bone fits. (See *SKELETON* for illustration.)

In life the lower opening of the pelvis is completed by certain muscles. Thus a deep basin is formed in which rest the lower part of the intestines, the bladder, and the internal organs of generation. During pregnancy, the infant rests in this cavity. The internal measurements of the pelvis in the female are of great importance in estimating the relative amount of re-

sistance which the infant will encounter at birth, and the method of conducting labor. Because of the different demands on the male and female pelvis, the latter is considerably broader and the opening wider.

**PEMBROKE**, the capital of Renfrew Co., Ontario, Canada, situated on the south shore of Allumette Lake, an expansion of Ottawa River, about 100 mi. northwest of Ottawa. With good steamboat connections and water power, Pembroke has become the chief town of the upper Ottawa Valley, an important center of the lumber trade, and of steel furniture, flour and woodworking manufactures. It is the seat of a Catholic bishopric. Champlain in 1613 ascended the valley to the Isle de Allumettes. Pop. 1921, 7,875; 1931, 9,368.

**PEMBROKE**, the county town of Pembrokeshire, Wales, lying on a peninsula at the head of the Pennar tidal inlet of Milford Haven, about 203 mi. northwest of London. It is dominated by the splendid ruins of a Norman castle, once the chief seat of the Pembroke Palatinate and, in Plantagenet times, one of the important fortifications of Britain. The circular vaulted keep survives, as does the great hall built over the "Wogan," a natural cavern with subterranean passage to the harbor. Nearby are remains of the Benedictine Monkton Priory of 1098. Pembroke Dock, established as a naval dockyard and garrison in 1814, was closed in 1926. Pop. 1921, 15,472; 1931, 12,008.

**PEMBROKE COLLEGE**, at Providence, R.I., a non-sectarian, privately endowed women's college, founded in 1892 as a part of BROWN UNIVERSITY. It is also known as the Women's College of Brown University, and has the same faculty as Brown. The productive funds in 1931 totaled \$541,594. The college has its own library, 7,277 volumes, located in Pembroke Hall. In 1931-32 there were 490 students and a faculty of 100, headed by Dean M. S. Morriss.

**PEMMICAN**, a compact, concentrated food of the North American Indians, usually prepared from thin slices of buffalo or deer meat dried in the sun or over a slow fire, pounded with stones and mixed with fat. Dried berries were often added to this concoction which could last, if necessary, for 4 or 5 years. The Indians of the Plains used the parfleche, a decorated rawhide bag, as a container for pemmican. A fish pemmican was made by the Indians of the Northwest by mixing dried fish with fish oil, while the Alaskan Eskimo mixed deer meat with fat and seal oil. Because of its lasting qualities a commercially produced pemmican has been relied upon as part of the food for both men and dogs in Arctic and Antarctic exploration of the past. The term is derived from the Cree Indian word *pimikan*, meaning "manufactured grease."

**PEMPHIGUS**, a disease of the skin characterized by the development of multiple blisters. The cause is unknown, but it is infectious. There are two forms. In common pemphigus there are successive crops of tense, rounded blisters on various locations in the body. These burst and discharge a quantity of clear serum. Foliate pemphigus is the more severe

form. The blebs are flattened and burst before they become tense. A raw, tender surface is exposed where each eruption has burst. New blebs form on the site of the old ones, the process continuing until sometimes the entire body is denuded of its outer layer of skin. In such cases, the only way excruciating pain can be avoided is for the patient to be in a constant water bath. It frequently ends fatally. Arsenic taken internally is about the only cure for the condition, and it often fails.

**PENANCE**, an ecclesiastical term signifying, according to Catholic teaching, an act of contrition for sin committed after Baptism. Public penance has been discontinued; but the institution itself is maintained as one of the seven sacraments of the Catholic Church, and it includes contrition, confession to a priest, absolution of the penitent by a priest, and satisfaction.

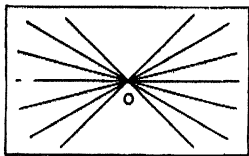
**PENATES**, in Roman religion, gods of the store-room, which in early Roman times was the central room of the house, including kitchen and living room. Each family had its own Penates on whose altar were laid gifts of food and garlands. The public Penates were the protectors of the State, and consuls and others taking political office propitiated them before entering upon their duties. AENEAS was said to have brought the Penates to Italy. They were closely associated with VESTA. Their full title was *Di Penates*.

**PENCIL DRAWING**. Modern pencils are made of clay and compressed black lead-powder in different proportions to give the desired degree of hardness or softness. In hard pencils there is more clay than graphite to produce grayness or lightness of line. This substance is set in wood or some form of metal holder, and sharpened in different ways to produce different kinds of lines or shading. Pencil drawings are made on paper, parchment or vellum.

Early examples of pencil drawing were done with plumbago, a black lead which is a sulphate of iron. Dutch artists made fine plumbago drawings in the 17th century, probably for the purpose of engraving. About the middle of the 18th century this substance was enclosed in wood and was no longer called plumbago. To-day pencil drawing is chiefly done by engineering draftsmen and architectural renderers, and by all graphic artists for sketching. For light tones and sharp lines hard pencils are used and soft pencils for dark tones and shading.

In *The Technique of Pencil Drawing* (1927), Bourrough Johnson asserts that the ability to render a wide range of tone depends on the manner of holding the pencil and on the cut of the lead. "The pencil should be held between the thumb and the first two fingers or, if the pencil is long enough, between the thumb and index finger." This gives proper control of the pencil and an opportunity to press with the thumb to render darker tones while the wrist is flexible and the finger-tips control direction and permits use of the pencil somewhat like a brush. The lead must be cut away in several different ways on different pencils to obtain narrow and broad strokes while supported by the wood on the

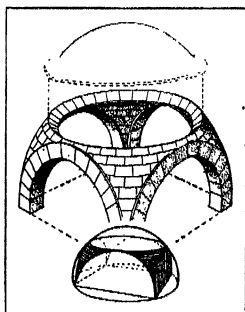
side not cut away. The aforementioned authority shows that the contour of a figure, or the outline of an object, can convey three dimensions, or solidity, as well as a shaded drawing by varying the quality of the line—strong, broad or thin. Solidity can be emphasized by bringing the contour sharp against a shadow, and by letting the contour be lost or become faint against a background of light or equal tones.



PENCIL OF RAYS

**PENCIL OF RAYS**, a system of straight lines which pass through the same point, called the center of the pencil. If the lines lie on the same plane, the pencil is called a flat pencil; otherwise it is also called a bundle of lines, or a sheaf of lines.

**PENDENTIVE**, in architecture, a triangular section of a sphere, built like a portion of a dome, and used to fill the upper corners of a square or polygonal room in order to give a circular shape at the top, on which a dome or dome drum can be built. The development of the pendentive is one of the most important achievements of **BYZANTINE ARCHITECTURE**. Pendentives were widely used in the Renaissance period in the crossings of domical churches. A pendentive dome is a method of roofing over a room or bay of square, rectangular, or polygonal shape by a continuous spherical surface. The sides of the room or bay are carried up vertically until they intersect the sphere in circular curves.



A. D. F. HAMLIN, A HISTORY OF ARCHITECTURE, LONGMANS, GREEN  
DIAGRAM OF DOME SHOWING PENDENTIVES

**PENDLETON, ELLEN FITZ** (1864- ), American educator, was born in Westerly, R.I., Aug. 7, 1864. She graduated in 1886 at Wellesley and became a tutor there in mathematics. After further study in 1889-90 at Newnham College, Cambridge, England, she returned to Wellesley in 1901 as dean and associate professor of mathematics, and in 1911 was elected president. Miss Pendleton has been an active member of the Association to Aid Scientific Research by Women.

**PENDLETON, GEORGE HUNT** (1825-89), American political leader, was born July 25, 1825, in Cincinnati, O. He attended local schools and Heidelberg University, Germany. He studied law and was admitted to the Ohio bar in 1847, beginning practice in Cincinnati. In 1853, as a Democrat, he was elected to the State Senate, serving from 1854-56. He was defeated as the Democratic candidate for the national House of Representatives in 1854, but was elected in 1856, serving in the House from 1857-1865. He was defeated for reelection to Congress in 1864 and

in 1866 and also as the vice-presidential nominee on the Democratic ticket with George B. McCLELLAN in 1864. He failed by a few votes to obtain the Democratic nomination for the presidency in 1868. He was at the time, a vigorous advocate of monetary inflation, urging the redemption of the government bonds by "greenbacks" or fiat currency. After his defeat as the Democratic candidate for governor of Ohio in 1869, he for ten years served as the president of the Kentucky Central Railroad. As a member of the United States Senate 1879-85, he introduced the Pendleton Act (1882) which created a civil service in the national government in an endeavor to end the evils of the "spoils system." He was chairman of the senatorial committee on civil service and his unrestrained ardor for reform in this respect undoubtedly prevented his reelection to the Senate. President Grover CLEVELAND appointed him United States Minister to Germany, March 23, 1885 and he served in that office until his death in Brussels, Belgium, Nov. 24, 1889.

**PENDLETON**, a city in northeastern Oregon, the county seat of Umatilla Co., situated on the Umatilla River, 44 mi. southwest of Walla Walla, Wash. Buses, airplanes and two railroads afford transportation. Pendleton is a market center for wheat, fruit, live stock and wool. It manufactures flour, woolen goods and saddles. The city is located on the old Oregon Trail. The headquarters of the Pendleton Round Up are here, and near by is the Umatilla Indian Reservation. Pendleton was incorporated in 1886. Pop. 1920, 6,837; 1930, 6,621.

**PENDLETON ACT**, *see* CIVIL SERVICE COMMISSION.

**PEN DRAWING**, an art having its roots in pictographic writing. The reed or stone stylus acquired a split nib as writing with colored fluid or ink on parchment and papyrus came into use. **ILLUMINATED MANUSCRIPTS** mark this development, with the instinct to illustrate and embellish the text. The earliest preserved specimen is that of the Egyptian



COURTESY METROPOLITAN MUSEUM OF ART

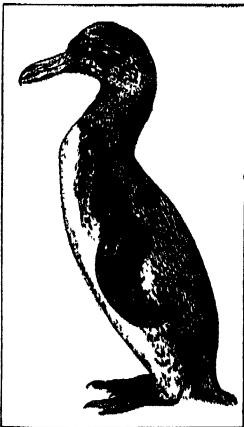
## EGYPTIAN PEN DRAWING

From the 21st dynasty funerary papyrus of Leye, Chantress of the deity Amun. Found at Deir el-Bahri, Thebes, Egypt. 1090-945 B.C.

*Book of the Dead*; the most sumptuous are French manuscripts of the 15th century with their true pen drawings of miniatures, drolleries and superb borders, rich in invention and design. These gradually gave way in the 16th century to black and white line drawings for the printed page. There is a directness in pen drawing as revealing as in handwriting, betraying strength and weakness. The limitations and conventionalities that hedge it in offer wide scope for originality in personal technique. The true artist,

has a fine restraint and a nice regard for his pen as a linear instrument, knowing that it cannot be excelled in sharp delineations of form and in precise draftsmanship. Suggestion of color, light and dark he effects through dots and openly spaced lines. Botticelli's set of pen drawings illustrating the works of Dante are a classic example of line drawing. In the present-day demand for pictures there is the underlying recognition that the photograph tends to dull rather than stimulate the imagination. (As the radio is dependent upon its selective quality, so a few lines and almost invisible touches of the pen center the point of interest, eliminate the nonessential, and the story flashes out at a glance.) With the simplest materials the merest tyro, if he has something to express, can achieve spirited effects, which photomechanical processes cheaply and faithfully reproduce. The crudest magazines as well as books and magazines of literary value are calling increasingly upon the pen artist for illustration and ornament. Advertising is a limitless field open to pen drawing where it harmonizes with the linear quality of print and its economy of means. Phil May (1864-1903), with his rigid economy of line and Charles S. Keene (1823-91) in his faultless records both showed what may be accomplished in humorous pen drawing. AUBREY BEARDSLEY gave rein to a creative imagination in pictorial decoration with a pen.

**PENELOPE**, in Greek mythology, daughter of Icarus of Sparta, was wife of ODYSSEUS and mother of TELEMACHUS. During her husband's absence at the siege of Troy and his subsequent wanderings, she put off all suitors by saying that she must first finish a robe she was making for her father-in-law, LAERTES.



GALAPAGOS PENGUIN (*Spheniscus mendiculus*)

This she never did, as she pulled out at night what she wove by day. The Arcadian Penelope, mother of PAN, is thought to be a different person.

**PENGÖ**, the Hungarian monetary unit, equivalent to 17.49 cents at par; it is a new unit, having been adopted in 1925.

**PENGUIN**, a rather primitive flightless, antarctic bird of the family *Spheniscidae* whose nearest relatives are the loons. They vary in size from a length of 16 to 48 inches according to the species. The short legs and webbed feet are situated so far back that when on land they walk upright with a comically dignified gait. Their flipperlike wings, which are rigid, and covered with scalelike feathers, are useless for flight, but highly efficient as paddles in swimming. Penguins pass most of their lives in the ocean, going about in schools with the ease of seals, and catching squids and

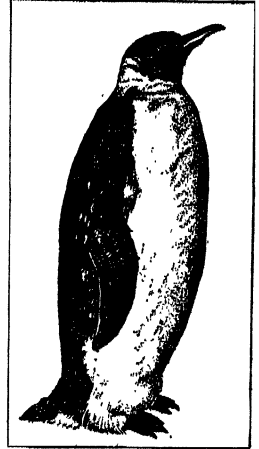
other mollusks, crustaceans and fish, for food. They rarely set foot on land or ice-floes except in the summer breeding-season, when they resort in colonies to available beaches or rocks on the Antarctic continent or adjacent islands; in such rookeries thousands may crowd together, each pair gathering bits of rubbish to simulate a nest and fighting in the midst of jostling and robbery to save the single egg or downy youngster. All species are mainly black and white, variously marked with yellow and orange.

E. I.

**PENINSULA**, primarily a body of land almost surrounded by water, connected with the mainland by an isthmus, as is Greece. In practice the term is freely applied. Such long, narrow extensions of the mainland as Italy, Scandinavia, Lower California, or Florida are classified as peninsulas. Spain and Portugal together are known as The Peninsula. A mountain chain extending from the mainland, usually forms the backbone of a peninsula.

**PENINSULAR WAR, THE**, that phase of the Napoleonic Wars concerned with expelling the French from the Spanish Peninsula. In the summer of 1808, Napoleon having declared his brother Joseph King of Spain, British troops were sent to the peninsula to cooperate with various rebelling Spanish and Portuguese forces. The campaigns of 1808-09 were a serious drain upon the French; but in the end the British under Wellesley, who became the Duke of Wellington in 1809, were practically confined to Portugal. In 1810 Napoleon sent heavy reinforcements to Spain, and until the spring of 1811 the British greatly outnumbered were hemmed in behind their fortification at Lisbon, the lines of Torres Vedras. During 1812, however, Napoleon withdrew great bodies of troops from Spain for his Russian Campaign, and Wellington was able to resume the offensive, clearing the passages into Spain and in July driving the French out of most of Spain by the capture of Salamanca. The rest of the war was a slow process of pushing the French over the Pyrenees, Wellington being greatly aided by Napoleon's disastrous retreat from Moscow, his defeat at Leipzig in Oct. 1913 and the rising of Germany. In December, Wellington made his first main drive into France, defeating Marshal Soult in the battle of Toulouse the day before Napoleon abdicated unconditionally to the Allies on the 11th of April.

**PENITENTIALS**, medieval books of rules designed to aid Catholic priests in prescribing penance for various sins. In accordance with the teaching of



EMPEROR PENGUIN, THE LARGEST SPECIES OF PENGUIN

the Church that, besides contrition and confession, some active penance is required to receive absolution, numerous rules relating to the time and manner of penance were laid down by councils and bishops of the early Church. Such rules came to be regarded as standards for the regulation of penance, and among the Anglo-Saxons and Irish they were collected into books known as *libri penitentiales*, which were in wide circulation in the Middle Ages.

**PENN, WILLIAM** (1644-1718), English Quaker, the founder of Pennsylvania, was born at London, Oct. 14, 1644, son of Admiral Sir William Penn. He was educated at Christ's College, Oxford, from which he was expelled with other students for rebellion against the king's order that surplices should be worn by the student body. At 24 years of age he became an adherent of the Society of Friends, and was several times imprisoned under the Conventicle Act, for preaching their doctrines. During an imprisonment imposed for writing *The Sandy Foundation Shaken*, 1668, he wrote his best known book, *No Cross, No Crown*, an exposition of Quaker doctrine. His inheritance from his father included a crown debt for £16,000, which was liquidated by Charles II with a grant of land in America, subsequently known as PENNSYLVANIA. When Penn made his first visit to America in 1681-82, he made a treaty with the Indians and founded PHILADELPHIA. Upon his return to England, he was suspected of intrigue to restore James II, with whom he had been a favorite, and the government of Pennsylvania was taken from him for two years. He made a second visit to the colony in 1699-1701. Owing to the inefficiency and dishonesty of his agents, he suffered the loss of nearly all his property and was imprisoned for debt until friends secured his release; this loss and the refusal of the colonial legislature to grant him a loan filled his last days with disappointment. Written works besides those mentioned include *The Great Case of Liberty of Conscience*, 1671, *Christian Quaker and His Divine Testimony Vindicated*, 1673, and *An Address to Protestants of All Persuasions*, 1679. He died at Ruscombe, Berkshire, July 30, 1718.

**PENNAHOOK**, a North American Indian tribal confederacy, including Agawam, Wamesit, Nashua, Souhegan, Amoskeag, Pennacook and Winnepesaukee, as well as others of the Algonkian linguistic stock. The Pennacook occupied the Merrimac River Valley and the nearby districts in New Hampshire, northeastern Massachusetts and southern Maine. Their affiliations were with the tribes to the north and later with the French. Decimated by smallpox and other causes, their population was greatly decreased upon the outbreak of King Philip's War, which the Nashua and Wamesit joined, the major group of Pennacook remaining friendly to the whites. In 1676 some of them moved to Canada and others went westward, followed by the English, who killed some of them, the remainder finding refuge with the Mahican at Scaticook in New York. The Pennacook in Canada lived first near Quebec, then joined by part

of the group from Scaticook settled in 1700 near St. Francis adjacent to the Abnaki refugees from New England, and until the breaking of the French power in Canada were outstanding enemies of the English. Descendants of this group still live at St. Francis.

**PENN COLLEGE**, at Oskaloosa, Ia., a coeducational institution, was incorporated as Spring Creek Union College in 1864. In 1873 the name was changed to Penn College. It is privately controlled, and affiliated with the Society of Friends. The grounds and buildings were valued in 1931 at \$407,789. The library contained 16,779 volumes. In 1931-32 there were 289 students and a faculty of 27, headed by Pres. Harlan L. McCracken.

**PENNEL, JOSEPH** (1860-1926), American etcher, lithographer and author, was born at Philadelphia, Pa., July 4, 1860, of Quaker parents. He attended the Philadelphia art schools and in 1884 went to Europe where, in collaboration with his wife, Elizabeth Robins Pennell, he produced several books of travel, among them *A Canterbury Pilgrimage*, 1885, *Our Sentimental Journey Through France and Italy*, 1888, and *Our Journey to the Hebrides*, 1889. The precision and delicacy of Pennell's work, made possible by a profound knowledge of drawing and draftsmanship, earned him a place in the forefront of American etchers. Typical subjects were skyscrapers, industrial mills or other heroic manifestation of the "American scene," whose decorative and linear values Pennell was possibly the first artist to recognize. Examples of his etchings and lithographs have been acquired by museums in Paris, Berlin, London, Venice, Florence, Rome, Washington, D.C., and New York City. His books, in addition to the many volumes he illustrated and the aforementioned travel works, include *Modern Illustration*, 1895, *The Authorized Life of J. McN. Whistler*, 1910 (with his wife), and *Pictures of War Work in America*, 1918. Pennell executed lithographs of the Pennsylvania coal-fields and also characteristic drawings of German and British iron-works. In 1917-19 he served as associate chairman of the U.S. Committee on Public Information. He died at Brooklyn, N.Y., Apr. 23, 1926.

**PENNIMAN, JAMES HOSMER** (1860-1931), American educator and author, was born at Alexandria, Va., Nov. 8, 1860. Graduating from Yale in 1884 he early devoted himself to educational matters, writing a number of professional papers and maintaining an intimate connection with the De Lancey School at Philadelphia. Upon his retirement from this school in 1913 he spent many years in study and writing upon the life of Washington. Penniman founded the Maria Hosmer Penniman Library of Education at the University of Pennsylvania, and the Penniman Memorial Library at Yale. He died at Philadelphia, Pa., Apr. 6, 1931.

**PENNIMAN, JOSIAH HARMAR** (1868- ), American educator, was born at Concord, Mass., July 20, 1868. He was educated at the University of Pennsylvania; where in 1896 he became professor



of English. The next year he was made dean of the faculty, a post he filled until 1909, when he was elected vice-provost. After serving 11 years in this office, and three years as acting provost, he became provost in 1923. His writings include *The War of the Theatres*, 1897; *A Book About the English Bible*, 1919, and many articles on education.

**PENNINE MOUNTAINS**, a system of hills in the north of England, running north and south, the watershed for many rivers including the Aire and the Ribble. The Cheviot Hills attach the Pennines to the Southern Uplands of Scotland. The highest summit, reaching 2,900 ft., is the Cross Fell in Cumberland, in the northern extremity. In the south in Derbyshire, the hills attain a height of 2,800 ft. The chain extends from the river Tyne through parts of Westmoreland, Northumberland, Lancashire, Yorkshire, Cheshire, Derbyshire and Staffordshire for a total length of 150 mi. Winding among the hills are narrow valleys which cut through in every direction and chop up the Pennines into many short ranges, giving the countryside a picturesque aspect. Around valuable coal and iron deposits of the region have risen densely populated manufacturing districts.

**PENNS GROVE**, a borough of Salem Co., N.J., situated on the east side of the Delaware River facing Wilmington, Del. Its transportation facilities include the Pennsylvania Railroad, ferries to Wilmington, motor bus and river steamship lines. Penns Grove is the trading center for an agricultural area and its manufactures include smokeless powder, carbonic ice, industrial alcohol, chemicals and dyes. It was granted its charter as a borough in 1894. Pop. 1920, 6,060; 1930, 5,895.

**PENNSYLVANIA**, a north Atlantic state of the United States, one of the original thirteen states of the Union, popularly called the "Keystone State." It is situated between 39° 43' and 42° N. lat. and 74° 40' and 80° 32' W. long. On the north it is



bounded by Lake Erie and New York, on the east by New York and New Jersey, on the south by Delaware, Maryland and West Virginia, and on the west by West Virginia and Ohio. Pennsylvania comprises an area of 45,126 sq. mi., inclusive of 294 sq. mi. of water surface. The state is

rectangular in shape with a maximum length of 302 mi. from east to west and an average breadth of 158 mi. In size it ranks thirty-second among the states of the Union.

**Surface Features.** Pennsylvania is made up of various subdivisions of the Appalachian mountain province. Of its area, 60% belongs to the Allegheny plateau which covers the western and northern parts, while the southeastern section is a succession of mountain ridges and valleys, the general trend of which is northeast-southwest. Starting at the southeast corner,

the state is crossed slantwise by a section of the Piedmont plateau which is paralleled to the northwest by South Mountain, a prong of the Blue Ridge. Between this range and the east-facing escarpment of the Allegheny plateau is a wide section of the Great Appalachian valley divided into two parts by the Blue Mountains. The southeastern part is essentially an open corridor known locally as the Cumberland and Lebanon valleys, but the northwestern part contains many parallel ridges usually evenly topped and frequently extending unbroken for 40 to 60 mi. The valleys between are narrow and have no connections except where rivers cut notches or gaps as in the case of the Delaware, Schuylkill, Susquehanna and Lehigh.

The Allegheny escarpment or front extends from the southern boundary in Somerset Co., northeastward into Center Co. where the West Branch of the Susquehanna cuts through to join the main stream. It is generally 2,500 ft. high but in Somerset Co. rises to 3,213 ft., the highest elevation in the state known as Negro Mountain. The mean elevation is 1,100 ft.

From its front the plateau slopes west and northwest, decreasing in height until it merges into the Ohio valley, and the lake plain. It is intricately dissected and cut into numerous river valleys running in every direction. A detached section is the Pocono plateau or mountains in the northeastern part of the state in Wayne, Pike, Monroe and Carbon counties. This is a picturesque region of many small lakes and mountain streams.

The drainage of Pennsylvania is carried partly to the Atlantic Ocean by the Susquehanna and the Delaware rivers, but in the western part the Allegheny and Monongahela rivers combine to form the Ohio whose waters eventually reach the Gulf of Mexico.

**Climate.** Because of its extensive mountainous areas interspersed with numerous valleys and also by reason of its proximity to the ocean on its eastern border, Pennsylvania displays considerable local variation in climate. The mean annual temperature is about 52° F. in the southeast, 50° F. in the central districts, 47° F. in the mountains of the northwest, and 49° F. on Lake Erie. At Pittsburgh the average for January is 30.7° F. and for July 74.6° F. The average annual precipitation is about 44 in. and is heaviest in the mountains. At Pittsburgh the average growing season is 184 days.

**Forests and Parks.** The entire land area of Pennsylvania, with the exception of portions of the Pocono plateau, was originally covered with an excellent forest growth of white and yellow pine, hemlock, oak, hickory, maple and other important timber trees. In a 1931 estimate over 13,000,000 acres or approximately one-half of the state is wooded but most of the mercantile timber has been cut and but 25,000 acres of the original forest remain. On Apr. 1, 1929, the 21 state forests comprised an area of 1,299,673 acres. Within these forests 38 public camps with open fireplaces, tables, and benches and usually a lake for boating have been established. Tents may



be erected upon permission from the district forester. Susquehannock State Forest in Potter and Clinton counties, with an area of 172,992 acres, has four camps including one at the famous Cherry Springs. Nine regions of unusual beauty within the forests have been set aside as State Forest Monuments. Also within these state forests are 7 forest parks ranging in area from 8 to 425 acres and 35 game preserves, with a total area 78,925.7 acres, containing deer, black bear, rabbit, raccoon, pheasants, grouse and other game. In addition to the forest parks, Pennsylvania has 5 state parks, VALLEY FORGE, WASHINGTON CROSSING STATE, Pennsylvania State (PRESQUE ISLE PARK), Fort Washington, and Bushey Run, each commemorating some historic event. A national park at Gettysburg administered by the War Department, commemorates the site of a famous Civil War battle. This park, 2,316.86 acres in area, contains what is probably the best marked battlefield in the world. Pennsylvania is second only to New York state in its tree planting and reforestation program. Between 1923 and 1927 over 70,000,000 trees grown in state nurseries were set out in the state forests and on privately owned land. In 1930, 18,048 acres were reforested, making a total of 124,201 acres planted since the inauguration of the program. Allegheny National Forest in the northwestern section of the state in June 1930 has a net area of 317,333 acres.

**Minerals and Mining.** Pennsylvania far outranks all other states in mineral production. From 1920 to 1930 the value of its mineral output was about one-sixth of that of the entire United States. The state, in addition to possessing practically all of the anthracite, contains the richest bituminous coal beds in the country, and in value the coal mined represents nearly three-fourths of the total mineral production of the state and about one-half of the total coal production of the United States.

From about 1750 until 1880 Pennsylvania was the principal producer of iron ore. With the development of the great iron mines in the Lake Superior region the state fell to minor rank in iron ore production. But, because of vast supplies of coal and limestone suitable for smelting, Pennsylvania has maintained its primacy in the production of pig iron. Following the sinking of the first oil well in America at Titusville in 1859 the state for 30 years was the outstanding producer of petroleum, and in 1929 surpassed in production all other states except Oklahoma, Texas and California. About 1885 began the extensive utilization of natural gas of which the state for many years was the chief producer.

Next in importance to coal and petroleum are widespread deposits of limestone utilized in making cement and lime, and of clays used for making brick, tile and pottery. Among minerals of minor value are basalt, granite, sandstone, sand and gravel, slate, silica, talc and copper ore.

With mineral productions in 1929 of \$892,913,833 or 17.2% of the total United States output, Pennsylvania stood first among the states, ranking first in bitu-

minous coal, anthracite, limestone, cement and slate; second in clay products, lime, sand and gravel, fifth in petroleum, and sixth in iron ore. The ten chief products in order of value were:

Product	Quantity	Value
Coal {anthracite . . . . .	73,828,195 tons	\$385,642,751
{bituminous . . . . .	143,516,241 "	258,607,000
Cement . . . . .	39,309,662 bbls.	55,600,953
Clay products . . . . .	.....	49,674,492
Natural gas . . . . .	101,951,000 M cu. ft.	48,821,000
Petroleum . . . . .	11,820,000 bbls.	44,800,000
Limestone . . . . .	.....	19,124,040
Sand and gravel . . . . .	12,674,320 tons	13,658,328
Lime . . . . .	782,915 "	5,896,752
Slate . . . . .	.....	4,798,200
Iron ore . . . . .	1,151,130 tons	2,382,839

In 1929 2,196 mines and quarries gave employment to 290,787 persons who received \$437,734,014 in salaries and wages. Of these 276,815 or 95% were engaged in coal mining, 150,494 in anthracite production and 126,321 in bituminous production; 6,540 in limestone quarries, and 2,074 in slate quarries.

**Soil.** The soils are largely loams of clay and silt derived from limestones which have decomposed. The most highly productive soils of this character occur in the southeastern part of the state, especially in the larger river valleys. An inferior slate soil is often found interspersed in the limestone regions and the soil in some sections is made less productive by the presence of decomposing sandstones. Northern Pennsylvania contains some glacial drift, but the soil derived from this formation is not well adapted to agriculture.

**Agriculture.** The principal crops include hay, corn, wheat, potatoes, vegetables, fruit and tobacco.

In 1930 15,309,485 ac. or 53.4% of the entire land area was in farms, 172,419 in number, with an average size per farm of 88.8 ac. and an average value per acre of \$78.58. Of the farm area 7,813,826 ac. or 51% was crop land; 4,576,192 ac. or 30%, pasture land; and 2,025,542 ac. or 13%, woodland. The total value of farm property was \$1,535,484,006, of which \$1,203,017,645 was represented by land and buildings; \$154,756,206, by implements and machinery; and \$177,710,155, by domestic animals.

According to the census of 1930 Pennsylvania produced in 1929 field crops to the value of \$197,110,742, ranking nineteenth among the states. It stood first in buckwheat, sixth in rye, seventh in tobacco, and eleventh in hay; it ranked third in sweet corn, fourth in potatoes, fifth in cabbages and ninth in all vegetables harvested for sale. It also stood fourth in grapes, fifth in apples, eighth in raspberries and ninth in peaches. The chief crops were grain, \$74,374,625; hay and forage, 3,166,308 tons, \$51,553,595, including timothy and clover 2,865,679 tons; vegetables (including potatoes), \$50,394,371; fruits, \$14,403,952, and tobacco, 50,584,276 lbs. produced from 40,040 ac., \$6,070,113. The grains included corn, of which 35,294,020 bu. were harvested for grain and 1,793,445 tons cut for silage; oats, 22,921,194 bu.;

wheat, 17,410,853 bu.; buckwheat, 2,537,287 bu.; rye, 1,653,997 bu., and barley, 570,633 bu. Potatoes, 20,756,447 bu. grown on 193,426 ac., were valued at \$32,910,709. Among other vegetables were sweet corn \$1,826,808, tomatoes, \$1,339,191, and cabbages \$1,169,086. The principal fruit crops were apples, 6,040,170 bu.; peaches, 1,234,410 bu.; grapes, 43,323,126 lbs.; strawberries, 6,196,363 qts., and raspberries, 2,206,652 qts.

Farm products sold by cooperative marketing rose from \$9,714,628 in 1919 to \$14,272,571, in 1929, and farm supplies purchased by this method from \$1,828,966 to \$3,677,293. Farm machinery and equipment in 1930 included 152,222 automobiles, 47,062 motor trucks, 33,513 tractors, 18,461 electric motors, and 57,340 stationary gas engines.

**Animal Industry.** Cattle-raising, chiefly for milk production, and poultry growing are the leading animal industries. According to the census of 1930 the rank of Pennsylvania among the states was fourth in dairy products sold, sixth in milk production, and eighth in chicken eggs produced, ninth in milk cows and eleventh in chickens grown. The state stood thirteenth in total value, \$177,710,155, of domestic animals. Among these were 1,511,202 cattle reported from 141,930 farms or 84% of all farms in the state and valued at \$104,826,582; horses, 311,739 in number valued at \$35,951,249; mules, 50,664, \$6,524,475; swine, 657,281, \$8,531,177, and sheep, 589,774, \$4,706,053.

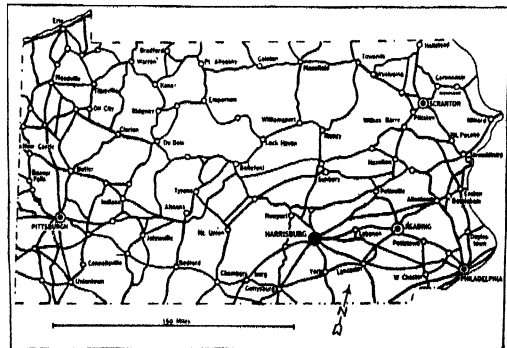
Of the cows on farms 900,048 were kept mainly for milk production and 23,075 mainly for beef production. In 1929, 479,930,541 gals. of milk were produced; the total value of dairy products sold was \$100,964,391, including \$91,570,715 for whole milk marketed. The value of all poultry raised was \$31,893,134. The number and value of the chief kinds were chickens, 25,640,160, \$29,585,419; ducks, 918,417, \$1,258,641; turkeys, 175,089, \$782,043, and geese, 101,677, \$267,031. The chickens sold, 13,310,130 in number, were valued at \$15,952,825. Of 119,624,063 doz. chicken eggs produced, valued at \$42,862,171, 97,428,078 doz. with a value of \$34,888,125, were marketed. The wool clip was 2,970,056 lbs., valued at \$1,054,563. Honey, amounting to 2,357,214 lbs. valued at \$497,145, was produced from 110,495 hives.

**Fisheries.** The commercial fisheries of the state are small, and in 1930 the catch amounted to but 1,385,000 lbs., valued at \$172,000. The inland lakes and streams offer good fishing sport and the state has a wise fish conservation policy. In 1930, 263,633 fishing licenses were issued, and \$395,450 was received in fees. Eight hatcheries were operated by 36 men at a cost in 1930 of \$192,158, an amount exceeded by only four states. The 1930 output was 749,551 trout, 255,905 bass, 283,521,028 other game fish and 114,430,000 commercial species, a total of 398,956,484 and a figure exceeded in only three states. Fish plantings in Pennsylvania waters by the U.S. Bureau of Fisheries included 6,750,000 sucker, 603,000

rainbow trout, 296,300 Loch Leven trout, 2,031,000 brook trout, 25,585,000 pike perch, 55,000 bass and sunfish, 20,000 Atlantic salmon and 20,000 other game fish.

**Transportation.** With Lake Erie on the west, Philadelphia on the Atlantic seaboard and a large mileage of navigable inland waterways, Pennsylvania is well equipped with facilities for transportation by water. The first improved waterway in Pennsylvania was a canalization of the Schuylkill River from Mt. Carbon to Philadelphia, in 1826. Soon afterward, to accommodate the coal traffic, the Lehigh River was similarly improved from Easton to Bristol. About this time Pennsylvania started construction of her through route from Philadelphia to Pittsburgh by a combination of water and rail routes. This line, designed to compete with New York's Erie Canal system, was never successful as it proved both inconvenient and expensive to operate. The first steam railroad was a link in this route, connecting Philadelphia with Columbia, on the Schuylkill River. It was authorized in 1828 and completed in 1834. Another line, connecting Philadelphia with New York City, was opened in 1837, the same year the line from Philadelphia to Baltimore was finished. In 1930 the total railway mileage of Pennsylvania was 11,154, with the Pennsylvania, the Philadelphia and Reading, the Lehigh Valley, the Baltimore and Ohio, the New York Central and the Erie the most important systems.

With the advent of modern highway construction in 1911, the state inaugurated a comprehensive high-



PENNSYLVANIA STATE ROADS

way program. Its system has been well maintained and extended. There were 116,821 mi. of highways on Jan. 1, 1930, including 26,145 mi. of surfaced roads and 9,846 mi. of improved state highways. During 1929, highway expenditures amounted to \$96,157,990, a sum exceeded only in New York. Motor vehicle registrations were 1,753,721 in 1930 compared with 1,330,433 in 1925. Trucking registrations rose from 181,359 in 1925 to 218,687 in 1930, while the number of buses in operation during the same period increased from 2,487 to 3,759, or over 50%.

**Manufactures.** Pennsylvania stands second only to New York in manufactures, a ranking held in the

returns of every Census since 1860. To a large degree Pennsylvania owes its industrial eminence to the vastness, variety and economic importance of its natural resources and to availability of raw material and accessibility to markets afforded by unexcelled transportation facilities, which include sea, lake and river ports and an immense network of railways. The supremacy in iron production established by Pennsylvania before the Revolutionary War has been steadily maintained, the state usually producing approximately one-third of the pig iron and two-thirds of the iron and steel rolling mill output of the nation. Since 1900 the state has shared in the great expansion of American manufacturing industry; the increase in total value of products during the 25-year period 1904-1929 was about 270%.

According to the Census of 1930 Pennsylvania with manufactures for 1929 valued at \$7,443,861,057 stood second among the states. Its 16,947 establishments gave employment to 140,864 officers and employees, who received \$369,843,068 in salaries, and to 1,014,046 wage earners, who were paid \$1,379,444,293 in wages. These factories used a total of 5,991,493 horse power, expended \$337,162,467 for fuel and power, and \$3,676,093,064 for materials and supplies, and added by the process of manufacture \$3,430,605,526 to the value of their output.

The leading manufactures, with products amounting to 60% of the output of the state, in order of value were:

Industry or Product	No. Persons Employed	Value of Products \$
Iron and steel rolling mill products . . .	159,621	1,212,876,856
Foundry and machine shop products . . .	67,675	374,041,290
Electrical machinery . . . . .	58,528	347,140,742
Silk and rayon . . . . .	64,735	320,935,551
Knit goods . . . . .	65,614	294,322,880
Pig iron . . . . .	8,906	280,711,528
Petroleum refining . . . . .	9,495	243,258,869
Steam railway carshop construction . . .	58,016	205,363,042
Printing and publishing, newspapers and periodicals . . . . .	25,566	200,500,834
Bread and bakery products . . . . .	26,514	170,608,502
Meat packing . . . . .	6,361	132,783,116
Coke . . . . .	6,713	115,345,477
Cigars and cigarettes . . . . .	26,322	108,061,016
Structural iron and steel . . . . .	13,929	102,230,002
Motor vehicles . . . . .	8,788	100,488,760
Men's clothing . . . . .	19,830	98,346,790
Leather . . . . .	9,465	95,958,590
Worsteds goods . . . . .	11,444	81,204,842
Glass . . . . .	20,095	81,050,092

In this highly diversified output there were 226 separately enumerated groups of manufactures. Besides iron and steel the state also ranked first in many other important products, as silk and rayon, knit goods, coke, glass, leather, chocolate and ice cream. It stood second in electric machinery, foundry and machine shop products, printing and publishing newspapers and periodicals, bread, beverages, textile machinery, street railway cars, and woolen goods. Among the products in which Pennsylvania ranked third were men's clothing, women's clothing, dyeing and finishing textiles, cigars and cigarettes, worsted

goods and wall paper. The state stood fourth in petroleum refining, canning vegetables, stoves, and confectionery; fifth in paper boxes, wooden boxes, engines and turbines, paints and varnishes and hardware; sixth in manufactured gas, machine tools, coffee grinding and ship building; seventh in furniture, paper and pumps, and eighth in motor vehicles, boots and shoes and cotton goods.

Philadelphia, together with Bucks, Chester, Delaware and Montgomery counties, produced an output valued at \$2,608,029,024, to which Philadelphia contributed \$2,003,710,905. Pittsburgh, together with environs in Allegheny Co., produced manufactures amounting to \$1,403,145,558, of which the city's share was \$545,318,655. Other important cities with outputs between \$124,000,000 and \$100,000,000 were Johnstown, Allentown, Reading, Chester and Erie.

**Commerce.** According to the census of 1930, there were in 1929 10,546 wholesaling establishments in Pennsylvania, with total sales of \$4,761,812,064. This volume represented 6.85% of the total for the United States, and was exceeded only in New York State and Illinois. The wholesalers gave full-time employment to 113,737 men and women, whose annual salaries and wages aggregated \$217,852,219. The chief wholesale distributing centers were Philadelphia and Pittsburgh, which reported total sales of \$2,265,489,053 and \$1,562,495,436 respectively. Scranton, Harrisburg, Wilkes-Barre, Reading, Lancaster and Bethlehem were also important.

The total sales of the 136,518 retail stores amounted to \$4,039,555,807, a volume surpassed only in New York State. Sales per store averaged \$29,590; sales per capita were \$419.42.

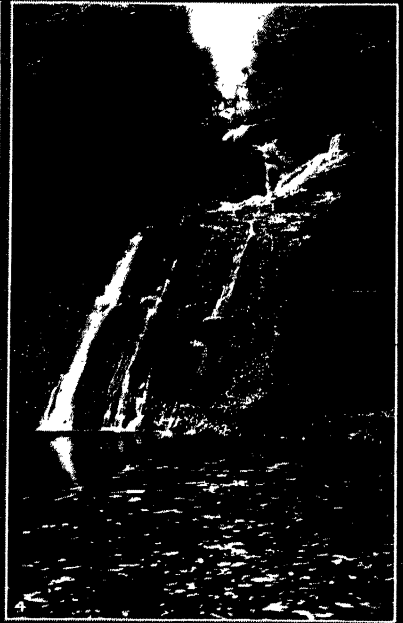
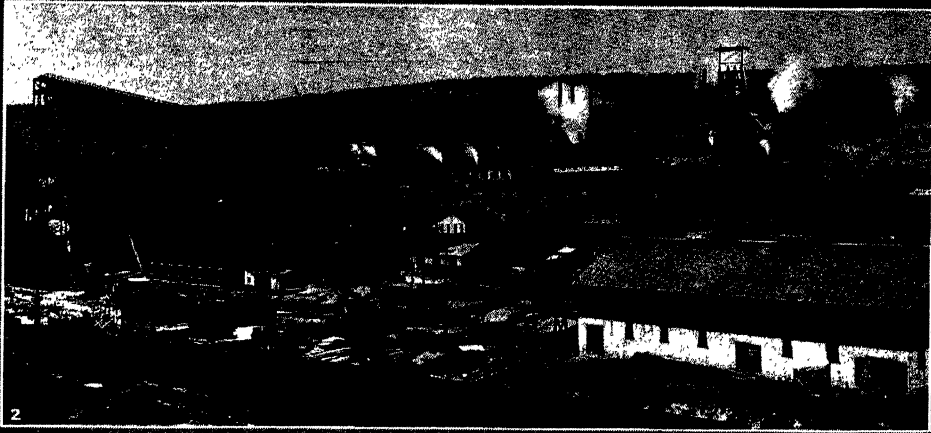
#### CHIEF RETAIL DISTRIBUTING GROUPS

Group	No. of Stores	Sales	% of Total
Food . . . . .	53,700	\$962,747,303	23.83
General Mdse. . . . .	10,390	821,917,552	20.35
Automotive . . . . .	16,505	655,020,531	16.21
Apparel . . . . .	11,137	383,688,653	9.51
Lumber & Bldg. . . . .	6,447	311,304,998	7.71
Furn. & Household . . . . .	3,698	207,369,556	5.14
All other stores . . . . .	34,641	697,507,214	17.25
Total, all stores . . . . .	136,518	\$4,039,555,807	100.00

Philadelphia, the principal port, handled waterborne commerce amounting to \$261,725,181 on the Delaware River and \$141,328,928 on the Schuylkill River. Pittsburgh was also important, with waterborne river traffic of \$199,956,297.

**Finance and Banking.** The assessed value of all taxable property in Pennsylvania in 1928 was \$12,555,656,482. On May 31, 1930, the total bonded debt was \$89,221,000, against which were sinking funds of \$8,070,728. Total state revenues for the year ended May 31, 1929 were \$153,713,648; total expenditures were \$135,987,207. The chief sources of revenue included special and property taxes, \$61,480,000, gasoline taxes, \$19,937,722, and licenses, \$66,091,000. The last figure includes the state tax on motor vehicles. The principal payments were for highways, \$42,847,-

# PENNSYLVANIA

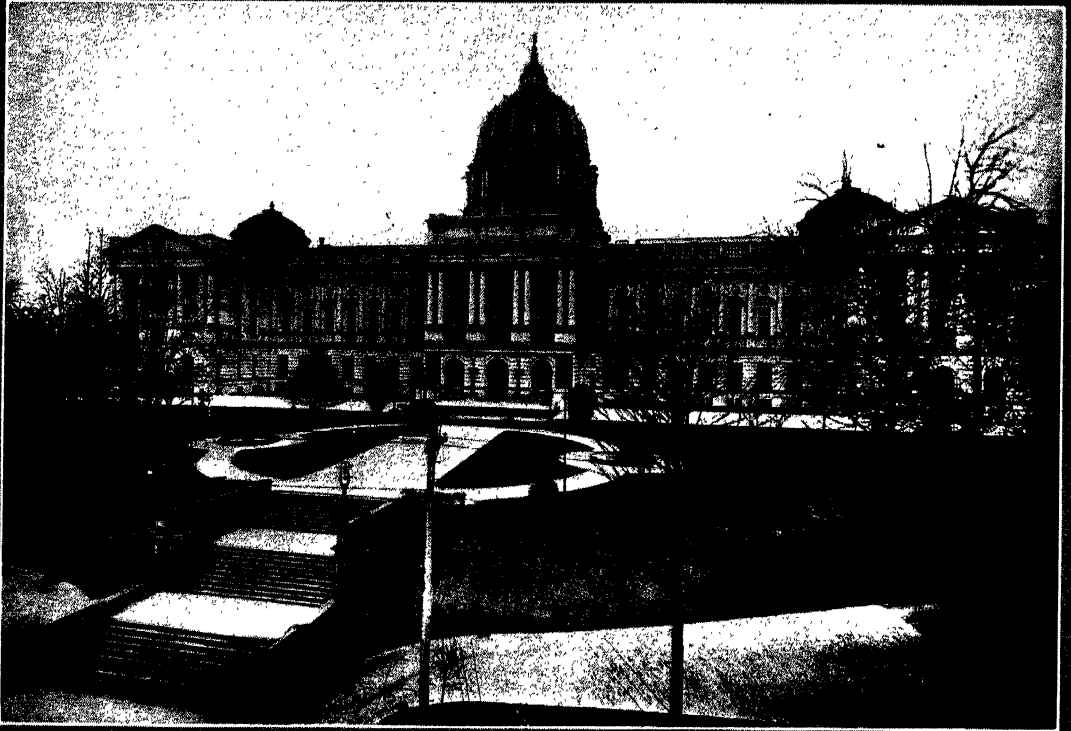


COURTESY PENNSYLVANIA DEPT. OF HIGHWAYS

## RURAL AND INDUSTRIAL SCENES IN PENNSYLVANIA

1. Pennsylvania country from the William Penn Highway, near Harrisburg. 2. Anthracite mine near Tamaqua, Schuylkill County. 3. Plant of the Bethlehem Steel Company at Steelton. 4. Indian Ladder Falls outside Milford,

## PENNSYLVANIA



1. PUBLISHERS' PHOTO SERVICE PHOTO; 2. COURTESY PHILADELPHIA ELECTRIC CO.

### PENNSYLVANIA'S CAPITOL AND THE SUSQUEHANNA

1. State Capitol in the center of the city of Harrisburg, dating from 1906.
2. The Conowingo Dam in the Susquehanna River, Maryland. The dam, one of the largest in the United States, was completed in 1928 and furnishes power to the city of Philadelphia and outlying districts.



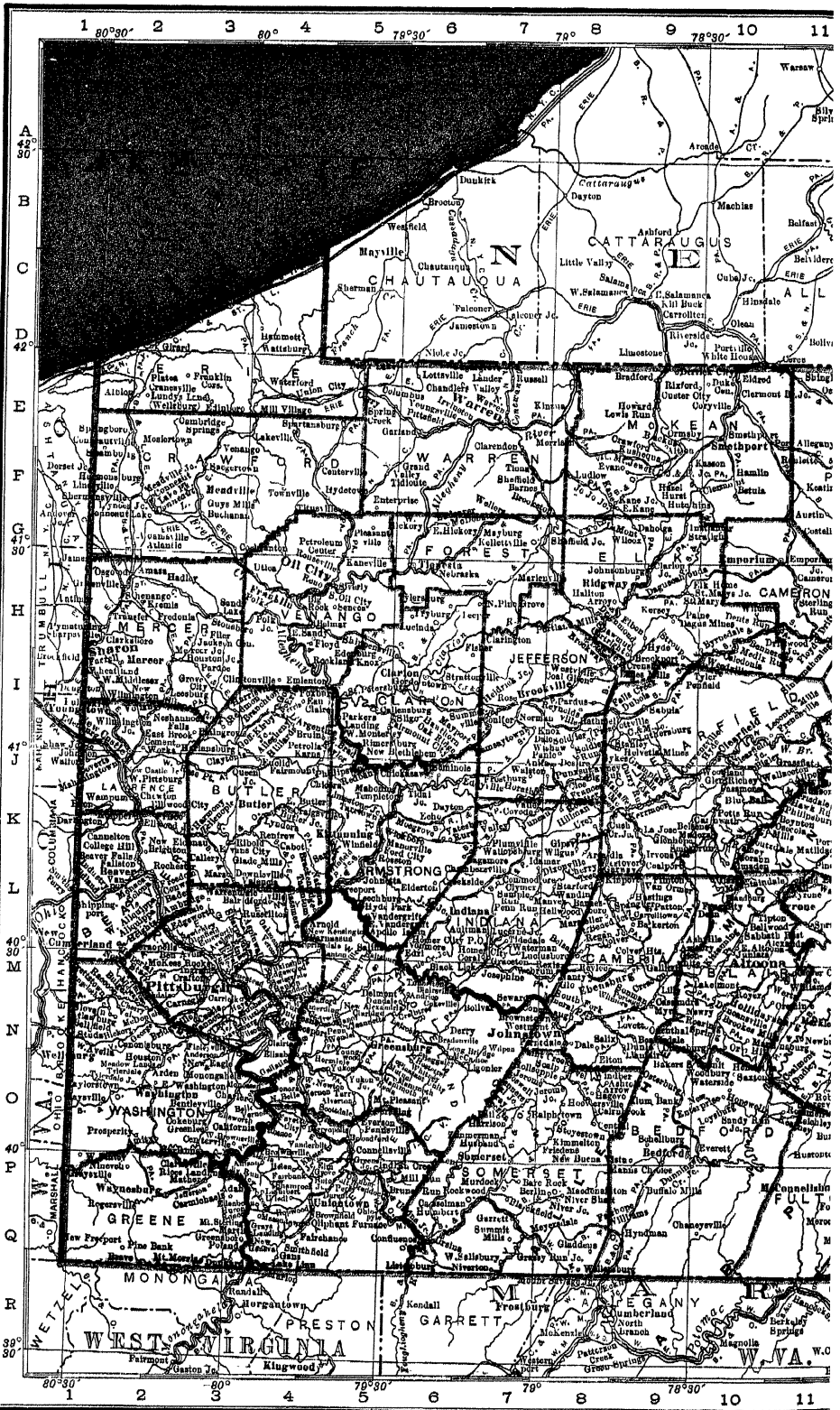
# PENNSYLVANIA

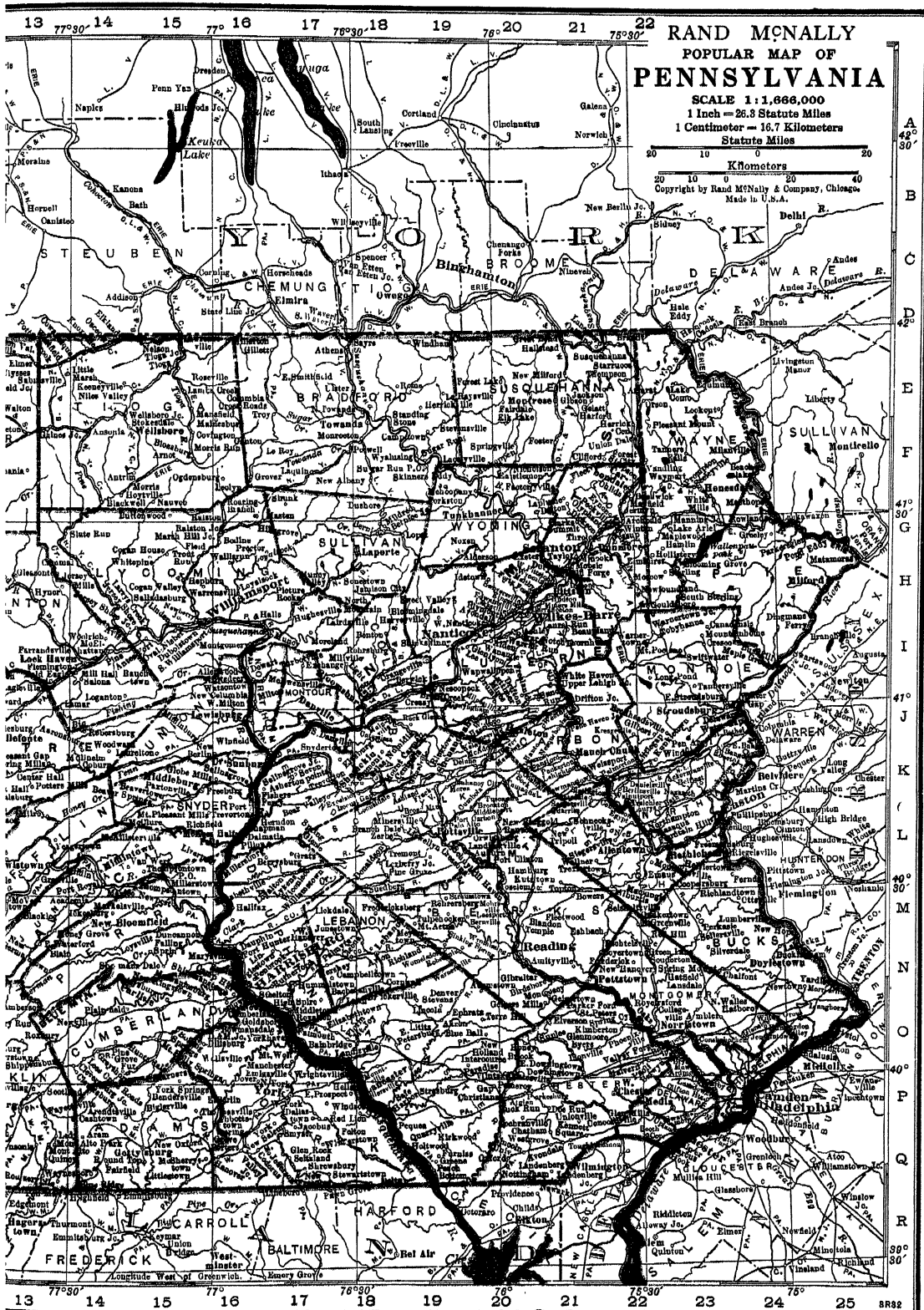
Area 45,126 sq. m.  
Pop. 9,631,350

## PRINCIPAL CITIES

Pop.—Thousands

- 27 Alliquippa... L 2
- 93 Allentown... L 22
- 82 Altoona... M 10
- 20 Ambridge... L 2
- 10 Archbald... F 22
- 10 Ardmore... P 23
- 11 Arnold... L 4
- 17 Beaver Falls... K 2
- 10 Bellevue... M 3
- 18 Berwick... J 19
- 68 Bethlehem... L 23
- 19 Bradnock... M 4
- 10 Bradford... E 9
- 12 Bristol... O 25
- 24 Butler... K 4
- 13 Canonsburg... N 2
- 20 Carbondale... F 22
- 13 Carlisle... O 15
- 18 Carnegie... M 3
- 14 Chambersburg
- 11 Charleroi... O 3
- 60 Chester... Q 23
- 15 Clairton... N 4
- 15 Coatesville... P 20
- 11 Columbia... L 18
- 18 Connellsville
- 11 Conshohocken... O 23
- 11 Coraopolis... M 2
- 10 Darby... P 23
- 12 Dickson... G 21
- 14 Donora... O 4
- 12 Dubois... I 9
- 23 Dunmore... H 22
- 21 Duquesne... N 4
- 34 Easton... L 23
- 12 Elwood Cy... K 2
- 116 Erie... O 2
- 14 Farrell... I 1
- 10 Franklin... H 4
- 17 Greensburg... N 5
- 17 Hanover... Q 16
- 80 Harrisburg... N 1
- 37 Hazleton... J 20
- 20 Homestead... M 8
- 10 Indiana... L 7
- 15 Joannette... N 5
- 67 Johnstown... N 5
- 22 Kingston... H 20
- 60 Lancaster... P 18
- 10 Lansford... K 21
- 11 Latrobe... N 6
- 16 Lebanon... M 18
- 13 Lewistown... L 13
- 10 Lock Haven... L 14
- 55 McKeesport... N 4
- 18 McKees Rocks
- 15 Mahanoy City... K 19
- 17 Meadville... F 3
- 21 Monessen... O 3
- 18 Mt. Carmel... K 18
- 13 Munhall... N 3
- 26 Nanticoke... L 19
- 10 New Brighton... K 2
- 49 New Castle... J 2
- 17 New Kensington... O 4
- 36 Norristown... O 23
- 10 Northampton
- 22 Oil City... G 4
- 13 Old Forge... H 21
- 11 Olyphant... G 21
- 1951 Philadelphia... P 24
- 12 Phoenixville... O 22
- 670 Pittsburgh... M 3
- 18 Pittston... H 21
- 17 Plymouth... J 20
- 19 Pottstown... N 22
- 24 Pottsville... L 19
- 111 Reading... N 20
- 143 Scranton... H 21
- 20 Shamokin... K 18
- 22 Sharon... I 1
- 22 Shenandoah
- 13 Steelton... N 19
- 16 Sunbury... K 16
- 16 Swissvale... M 4
- 13 Tamaqua... K 20
- 19 Tarentum... H 21
- 10 Taylor... H 21
- 11 Turtle Cr... N 4
- 20 Uniontown... P 4
- 12 Vandergrift... L 5
- 15 Warren... E 7
- 25 Washington... O 2
- 12 W. Chester... P 22
- 87 Wilkes-Barre... L 21
- 30 Wilkensburg
- 46 Williamsport... M 4
- 10 York... H 16
- 55 York... P 17









708, debt service, \$4,115,895, permanent improvements and operation of general departments. In addition, \$26,730,446 was spent for education.

The Bank of North America, chartered by Congress in 1781, was the first bank in the United States as well as the first bank in the state of Pennsylvania. By 1814 there were six banks in the state, including the Bank of Pennsylvania, which was the official agent of the state. Laxity of supervision led to currency inflation, which caused suspension of specie payments in 1816. In 1819 the law providing for forfeiture of charter in case of suspension of specie payments merely reduced the number of banks. Specie payments were generally suspended again in 1837. Little respite from depression was afforded the banking community before 1857, when several banks failed, causing another banking crisis. In 1860 a free banking law was enacted, modeled after New York's. The advent of national banking and the new system finally stabilized the banking situation. The popularity of national banking did not wane as early in Pennsylvania as it did throughout the country. Recently, however, the trend has reversed, and trust companies, with their more liberal charter provisions, are coming to the fore. In 1930 there were 1,478 banks in Pennsylvania. Of these, 827 were national banks, 620 trust companies and state banks and 31 private banks. Their total capital was \$358,820,750; their surplus and undivided profits, \$879,221,000. Total resources in 1930 were \$6,968,476,000, with loans and discounts, including rediscounts, aggregating \$3,094,656,000. Demand deposits were \$2,045,865,000; time deposits, including postal savings totaled \$2,788,347,000. Per capita demand and time deposits were \$499.92; per capita savings deposits, \$279.65. The total savings of \$2,704,217,000 were owned by 5,007,348 depositors. National bank circulation aggregated \$82,659,000. Bank clearings in 1930 were \$29,283,000,000 in Philadelphia, the state's most active banking center. This figure was exceeded only in New York City and Chicago.

**Government.** The legislative power of the Commonwealth of Pennsylvania is vested in a General Assembly consisting of a Senate composed of 50 members and a House of Representatives of 208 members, the former elected for terms of four years and the latter for terms of two years. They meet in biennial sessions unlimited in duration. The chief executive is the governor, elected for a term of four years, but ineligible to succeed himself as a candidate for election. He receives a salary of \$18,000 per annum. Other executive officers are the lieutenant governor, secretary of the commonwealth, attorney-general, auditor-general, treasurer, secretary of internal affairs and superintendent of public instruction. The governor appoints the secretary, attorney-general, and the superintendent of public instruction. Judicial powers are vested in a supreme court, a superior court, courts of common pleas, courts of oyer and terminer and general jail delivery, courts of quarter sessions of the peace, orphans' courts, and magistrates' courts. The

supreme court consists of 7 judges elected for terms of twenty-one years, with salaries per annum of \$13,500 for the chief justice and \$13,000 for the other judges.

**Social Welfare Institutions.** Pennsylvania has a State Welfare Commission, the Department of Welfare being at Harrisburg. The state partially supports a number of institutions for the deaf, blind, veterans and their children and hospitals. There is an industrial home for women at Muncy and an industrial reformatory at Huntingdon. A training school is maintained at Morgantown, a school for boys at Glen Mills and for girls at Darling. State schools for feeble-minded are at Pennhurst and Polk, a state village is at Laurelton. At Selinsgrove is a colony for epileptics and at North Cumberland an institution for deficient male delinquents. Hospitals for insane are at Allentown, Danville, Waymart, Harrisburg, Norristown, Torrance, Warren and Wernersville. Medical and surgical hospitals are located at Ashland, Blossburg, Coaldale, Connellsville, Hazleton, Shenandoah, Nanticoke, Philipsburg, Scranton and Shamokin. State aid is given to the aged. The counties support the almshouses. Penitentiaries are at Philadelphia and Pittsburgh.

**Education.** The first school was in operation at Uplands before 1675, when Swedish colonists occupied the land. When William Penn took over his grant of land he made extensive provisions for education. Laws passed in 1682 and 1683 required children to be taught to read and write and to learn a trade. The first regular school established in the state was conducted in Philadelphia in 1683. The Friends Public School, founded in Philadelphia in 1689 has been continuously in existence. Moravian schools were founded at Bethlehem and Nazareth before 1750. In 1928 there were 13,841 school buildings in the state, with 1,621,650 enrolled pupils in the public elementary schools and kindergartens, and 262,779 pupils in the secondary schools. School attendance is compulsory for children from 8 to 16 years of age for the full term.

The number of persons from 5 to 20 years of age attending school in 1930 was 2,135,688, or 69.4% of the population within the ages specified, as compared with 1,721,773, or 64.4%, in 1920. The number of persons, 10 years and over, unable to read and write in 1930 was 240,323, or 3.1%, as compared with 312,699, or 4.6%, in 1920. Foreign-born white illiterates numbered 187,942, or 15.4%, in 1930, and 258,812, or 18.9%, in 1920.

Among the numerous institutions of higher learning, the state maintains a forest school at Mont Alto, 14 normal schools, Pennsylvania State College at State College, and contributes to the UNIVERSITY OF PENNSYLVANIA at Philadelphia, the UNIVERSITY OF PITTSBURGH, Temple University at Philadelphia, and several medical colleges in that city. Other important educational institutions include Lehigh University at Bethlehem, Carnegie Institute of Technology at Pittsburgh, Bryn Mawr College at Bryn Mawr, Dickinson

College at Carlisle, Lafayette College at Lafayette, Franklin and Marshall College at Lancaster, Swarthmore College at Swarthmore, Haverford College at Haverford, Washington and Jefferson College at Washington, and for Negroes, Lincoln University at Lincoln. The Library Extension Division of the Pennsylvania State Library has its headquarters at Harrisburg.

**Population.** In 1930 Pennsylvania ranked second among the states with a population of 9,631,350 or an average of 214.8 per sq. mi., an increase of 911,333 or 10.5% over 1920. The population rose from 434,373 in 1790 to 2,311,786 in 1850, 6,302,115 in 1900, 7,665,111 in 1910 and 8,720,017 in 1920. In 1930 there were 9,192,602 or 95.4% whites and 431,257 or 4.5% Negroes, an increase of 9.0% whites and 51.5% Negroes from 1920. Of the whites, 7,959,551 were native-born and 1,233,051 were foreign-born, a decrease in the latter of 154,799 from 1920. Of the total foreign stock, including foreign-born, foreign and mixed parentage, 613,257 or 16.2% were Italian; 516,041 or 13.6%, Polish; 487,241 or 12.9%, German; 335,208 or 8.8%, Czechoslovakian; 285,398 or 7.5%, Irish. The urban population was 6,533,511 or 67.8% of the total, an increase of 925,696 or 16.5% from 1920; the rural population was 3,097,839 or 32.2% of the total, a decrease of 14,363 or 0.5% since 1920. There were in 1930 five cities of 100,000 and upwards: Philadelphia, 1,950,961; Pittsburgh, 669,817; Scranton, 143,433; Erie, 115,967; Reading, 111,171.

**Occupations.** In 1930 3,722,103 persons, or 38.6% of the population, were gainful workers 10 years old or older; 78.4% were males and 21.6% were females; 76.1% were native white; 18% foreign-born white, and 5.8% Negro. Of the females 15 years old or older, 66.8% were single, 20.8% were married, and 12.4% widowed or divorced.

Among the principal occupations, with number of workers, were factory operatives and laborers, 539,040 men and 190,900 women, including 127,117 persons in iron and steel industries, 54,905 persons in silk mills, 52,935 persons in clothing industries, and 44,237 persons in knitting mills; coal mine operatives, 267,724; farmers, 145,902, and farm wage workers, 84,514; clerks, 142,795 men and 74,679 women; salespersons, 109,171 men and 48,328 women; servants, 20,374 men and 127,437 women; retail dealers, 134,024; school-teachers, 14,708 men and 60,566 women; chauffeurs, 752,211; machinists, 69,912; carpenters, 67,525; stenographers, 64,088; bookkeepers and cashiers, 18,267 men and 34,499 women; building laborers, 46,021; steam railroad laborers, 42,243; manufacturing foremen and overseers, 34,612; painters, glaziers and varnishers, 28,299; waiters, 9,976 men and 98,254 women; electricians, 26,691; barbers and hairdressers, 19,063 men and 7,500 women; street laborers, 25,723; and trained nurses, 25,361.

#### HISTORY

Johan Printz, governor of New Sweden (*see DELAWARE*), in 1643 founded New Gottenburg, on Tini-

cum Island, the first settlement within the present limits of Pennsylvania. Nearby, at Upland, renamed Chester, a community was soon flourishing. The Swedish settlements passed to the Dutch in 1655 and to the English in 1664 (*see NEW YORK*). WILLIAM PENN on Mar. 4, 1681, received from Charles II, who was indebted to Penn's father, a grant of territory west of the Delaware River between latitudes 40° and 43°. Philadelphia was founded by commissioners who preceded Penn; the proprietor arrived at Upland in October, 1682, and the first General Assembly, meeting there in December, adopted Penn's "Frame of Government," which delegated to the people more privileges than colonists elsewhere on the seaboard possessed. In 1683 Penn purchased the land title from the Indians, with whom peace was maintained until Scotch-Irish settlers on the frontier promoted turbulence. The growth of the colony, in part because of skillful advertising, was immediate. Philadelphia contained over 500 inhabitants before 1683, while the province had gained 3,000. Welsh Quakers in Delaware and Montgomery Counties, Protestants from the Palatinate in the Cumberland valley, Moravians in Lehigh and Northampton Counties, Menonites in Germantown, and Scotch-Irish Presbyterians in the back country diversified the colony. Quaker and German elements were dominant politically; the Scotch-Irish, different in temperament and facing the rigorous problems of frontier existence, were usually in opposition. Settlers were dilatory in paying Penn his quit-rent. The Assembly was contumacious and disputes were frequent before Penn, on leaving the colony in 1701, promulgated a new constitution making the assembly the sole law-making body. Differences between the Assembly and his successive heirs were relatively minor, and the colony became increasingly prosperous as Philadelphia developed commercially and the thrifty Germans raised wheat and livestock for export. The FRENCH AND INDIAN WAR began in western Pennsylvania; at its conclusion the fur trade expanded, Pittsburgh became a post of importance, and pioneer settlement followed the paths hacked through the forest by the British and colonial troops, Braddock's Road and Forbes' Road.

Boundary disputes were settled with MARYLAND and DELAWARE in 1750 (*see MASON AND DIXON LINE*), VIRGINIA in 1784, CONNECTICUT in 1782. At the outbreak of the Revolution Pennsylvania had a population of about 300,000. The neutrality of many Quakers and other sectarians and the loyalism of the large Church of England element was offset by the Germans, then numbering a plurality, and the Scotch-Irish, who conjointly assumed the reins of government. John Dickinson, ROBERT MORRIS, and BENJAMIN FRANKLIN were among the Pennsylvanians who rendered distinguished service to the patriot cause. Much of the military history of the REVOLUTIONARY WAR is concerned with Pennsylvania soil. The two Continental Congresses met in Philadelphia, except during the months of British occupation; there the Declaration of Independence was adopted, and soon

afterward a convention of delegates from the Pennsylvania counties drew up a state constitution—providing for a unicameral legislature, and for an elective council rather than a governor—which went into effect in September, 1776. The proprietorship and the Quaker dominance simultaneously passed out of existence.

Pennsylvania ratified the federal Constitution on Dec. 22, 1787, and in 1790 revised its own constitution into more conventional forms. The state capital was moved successively westward as population increased and was more evenly distributed—from Philadelphia to Lancaster in 1799, thence to Harrisburg in 1812. Communications were improved (*see* PENNSYLVANIA SYSTEM); iron manufactures were developed, attracting thousands of Irish settlers, who after the Civil War were “pushed upward” from labor in the coal mines and iron foundries and on the network of railroads by successive waves of central-European immigration. Pennsylvania early had more than its share of extra-legal ebullitions of democratic will, which led to riots (*see* FRIES’ REBELLION, WHISKY REBELLION); but conditions in the mines gave rise to really sinister lawlessness (*see* MOLLY MAGUIRES). Labor disputes in the Pennsylvania steel, oil and railroad industries have included the most serious strikes known in the United States. Usually Democratic before the Civil War, in which conflict Pennsylvania was invaded by Gen. Lee’s army (*see* GETTYSBURG), antislavery sentiment and the desire for protectionism in tariff brought the state into the Republican column in 1860, where, except in 1912, it has since remained. Since the Civil War Don Cameron, Matthew S. Quay, Boies Penrose and William S. Vare have successively dominated powerful Republican machines in the state. In 1922 and 1930 Gifford Pinchot was elected governor without the support of the Republican organization led by Vare. In the face of the Democratic landslide of 1932, Pennsylvania remained true to its political colors and gave its 36 electoral votes to Hoover. James J. Davis, Republican, was reelected to the United States Senate.

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**PENNSYLVANIA, UNIVERSITY OF**, a non-sectarian, semi-coeducational institution founded in 1754 in West Philadelphia, Pa. It had its original nucleus in a charitable school founded in 1740. To this institution an academy was added in 1751, the latter’s foundation due chiefly to a pamphlet, *Proposals Relating to the Education of the Youth in Pennsylvania*, written by Benjamin Franklin in 1749. Franklin was also the first president of the academy’s board of trustees. In 1753 the combined academy and charitable school obtained a charter from Richard and Thomas Penn, and in 1755 the combined institutions became the College and Academy of Philadelphia. Closed for a year and a half during the Revolution, the college was transferred in 1789 to the

trustees of another institution, the University of the State of Pennsylvania, but in 1789 it was restored to the original trustees. By an act of 1791 the college was incorporated with the University of the State of Pennsylvania as the University of Pennsylvania. The university moved from the heart of the city to its present site in West Philadelphia in 1872. The University of Pennsylvania established the first Medical School in the United States in 1765. Besides the Medical School and the College, the present university includes the following schools and departments: the Law School; University Hospital; Towne Scientific School; departments of Physical Education, Architecture and Music; Wharton School of Finance and Economy, the pioneer of business schools of collegiate rank; Graduate School; Veterinary School; Laboratory of Hygiene; Wistar Institute of Anatomy; College Courses for Teachers; Flower Astronomical Observatory; Summer School; Henry Phipps Institute of Tuberculosis; Extension Schools; schools of Education, Dentistry and Fine Arts; courses in Military Science and Business Administration; Graduate School of Medicine; Moore School of Electrical Engineering; Carter Foundation for Child Helping; and the Graduate Hospital. The majority of the schools are open to women. The productive funds in 1930 totaled \$18,390,385. The library contained 740,294 bound volumes. In 1930-31 the university enrolled 15,800 students and had a teaching staff of 1,443 members headed by Pres. THOMAS S. GATES.

**PENNSYLVANIAN PERIOD**, formerly considered the second subdivision of the Carboniferous period, but now considered as ranking as the sixth period in the Paleozoic era of geological history. Great coal deposits were formed then. *See also* CARBONIFEROUS PERIOD; PALEOZOIC ERA.

**PENNSYLVANIA STATE COLLEGE**, at State College, Pa., a coeducational state institution, founded in 1855 as a secondary agricultural school known as The Farmer’s High School. This institution in 1862 became the Agricultural College of Pennsylvania, and in 1874, as a result of the benefits received under the Federal Land Grant Act of 1862, was chartered as the Pennsylvania State College. It maintains schools of Agriculture, Chemistry, Education, Engineering, Liberal Arts and Mines, and a Graduate School. Experimental work is conducted in agriculture, engineering and nursing. The grounds and buildings were valued in 1931 at \$8,683,139. The library of 126,784 volumes contains the Beaver Collection of Pennsylvania History, and the Edwin Erle Sparks Memorial Library of American History and Biography. In 1931-32 there were 4,900 students and a faculty of 525, headed by Pres. RALPH DORN HETZEL.

**PENNSYLVANIA SYSTEM**, a unique thoroughfare, of canal and railroad in combination, from Philadelphia to Pittsburgh. It was highly important as an artery of commerce and pioneer travel. The success of the ERIE CANAL, and the prospect of a canal linking the Ohio River system and the Chesapeake (*see* CHESAPEAKE AND OHIO CANAL), prompted

the State of Pennsylvania, Feb. 25, 1826, to authorize the construction of the Pennsylvania Canal at state expense. Canals were planned from the Swatawara River to the mouth of the Juniata, and from Pittsburgh to the mouth of the Kiskiminetas River. Hollidaysburg, on the eastern slope of the Appalachians, and Johnstown, on the western, were eventually selected as termini. A continuous highway across the state was to be effected by linking Hollidaysburg and Johnstown with a railway of inclined planes, crossing the watershed at Blair's Gap. The Union Canal and the Columbia Railway linked Philadelphia with Columbia, where the eastern canal began. The Allegheny Portage Railroad was built 1831-33, by which time the canals were completed. This pioneer engineering enterprise, designed by Moncure Robinson, was a system of ten inclined planes with stationary engines. The crest of the range was pierced by a mile-long tunnel. The total cost of canals and railroad was \$10,038,133.25 for the 394¼ miles. A rush of business followed the opening of the Pennsylvania system, Mar. 18, 1834. A second track was put under construction within a few months. The importance of the system was undimmed until the Pennsylvania Railroad had crossed the mountains. The Pennsylvania Railroad purchased the system in 1857, closed the Portage Railroad in that year, and gradually abandoned use of the canals.

**PENNY**, a bronze British coin equal to one-twelfth of a SHILLING; also the name often applied to the CENT of the United States and Canada. The present British penny was introduced in 1860. Its predecessors were a copper penny of the early 19th century and a silver penny of the 17th century.

**PENN YAN**, an industrial and agricultural village in western New York, the county seat of Yates Co., situated on the northern end of Lake Keuka, 45 mi. southeast of Rochester. Bus lines and two railroads afford transportation. The region is a fertile area, noted for its fine fruits, wheat and vegetables. The chief local industries include canning and the manufacture of clothing, paper, baskets, store fixtures, flour and grape juice. The village is an attractive summer resort in the beautiful Finger Lakes region. Penn Yan, taken from Pennsylvania and Yankee, denotes the origins of the first settlers. The settlement began in 1779; the village was incorporated in 1833. Pop. 1920, 4,517; 1930, 5,329.

**PENNY POSTAGE**, a term meaning prepayment of mail at a low rate by means of an affixed label. The custom originated in England as the result of the efforts of Rowland Hill. In the early years of the 19th century England was faced with a need of increased revenue to carry on the Napoleonic wars. This caused steep increases in postage rates, which ran from eight cents per letter for a distance of 15 mi. to 34 cents for 700 mi. These rates held for many years, producing postal revenues three times as great as the expenditures but making correspondence by mail impossible for large numbers of people. Rowland Hill began his campaign for cheaper postage in 1836. He

published a pamphlet in which he attempted to show that the postal system was badly managed and urged the adoption of cheaper rates, and a prepaid system based wholly on weight without regard to distance, the payment to be made by means of stamps. Parliament undertook a careful investigation of his plan and in 1840 the first penny postage stamps were made, sold, and used in England. In the next few years most of the countries of Europe and America followed England's example.

**PENNYROYAL** (*Mentha Pulegium*), a small creeping perennial herb of the mint family used for seasoning. It is a native of Europe and western Asia, widely grown in gardens, especially in Europe, as a "sweet herb." The American pennyroyal (*Hedeoma pulegioides*), a closely allied plant of the mint family, is a very slender, erect, much branched annual about a foot high. It is native to dry fields in the eastern United States and Canada. From it is obtained the commercial oil of pennyroyal. Infusions of the leaves of both plants are used in household medicine.

**PENOBSCOT**, an Algonkian tribe, the most populous member of the North American Indian Abnaki confederacy. Formerly they inhabited the district on both sides of Penobscot Bay and River, and claimed in addition the whole Penobscot River Valley. In summer they lived on the sea, but in winter occupied the territory near the Penobscot Falls. They still maintain a village at Oldtown on Indian Island, Me., and own also many islands in the Penobscot River. They number slightly over 400 and live the life of their white neighbors.

**PENOBSCOT RIVER**, the largest river in Maine, rising in Somerset Co. near the Canadian line. Its upper course meanders eastward through the swamps and lakes of Piscataquis Co. and after issuing from the southern end of Pemadumcook Lake, it flows southward and enters the Atlantic Ocean through Penobscot Bay. The area drained covers 8,934 sq. mi., two-thirds of which is timber land diversified by numerous lakes. The river is about 350 mi. long and has a fall of 1,509 ft. It supplies water power for many manufactures, particularly the pulp and paper mills at Old Town, West Enfield and Millinocket. It is navigable to Bangor, about 60 mi. from the sea. The Piscataquis and Mattawamkeag rivers flow into its middle course.

**PENOLOGY**, the science of punishment, having as its aim the protection of society. In the past there has been little or no science applied to the question, as society has been concerned chiefly with its own protection, rather than with determination of the proper kind of punishment.

About 1876, Lombroso, an Italian, advanced the then unique theory of punishment based on the nature of the criminal rather than on the nature of the crime. Modern psychology and psychiatry have developed this theory although on a basis of measuring the criminal entirely different from that conceived by Lombroso.

Because punishment as a deterrent has failed, so-

ciety is looking to protection by treatment. Mental, physical and social conditions are being recognized as causal factors. Psychiatry is the key note and it is hoped that clinics will be established in every court and that mental and physical examinations will become mandatory before sentence is passed. Modern penologists are substituting probation, parole, and specialized institutional care to a great extent for penal servitude and corporal punishment. Conditions throughout the country are by no means uniform. Education is necessary before forward looking legislation can be brought about. G. W.

**PENROSE, BOIES** (1860-1921), American legislator, was born at Philadelphia, Pa., on Nov. 1, 1860. After graduating from Harvard in 1881, he studied law in Philadelphia. In 1883 he was admitted to the bar, and began to practice in his native city. He was elected to the state house of representatives in 1884 and to the state senate in 1887, where he served until 1897, being president *pro tem* in 1889 and 1891. In 1897 he was elected to the United States Senate, and was reelected three times thereafter. In the Senate Penrose was a power in the Republican group, and served on many important committees. A member of the old Guard conservatives, he supported President Taft against THEODORE ROOSEVELT for the Republican presidential nomination in 1912. In 1920 he joined the coterie of Senators which finally secured the nomination of WARREN G. HARDING for the Presidency. He died at Philadelphia on Dec. 31, 1921.

**PENSACOLA**, a city and port of entry in northwestern Florida, the county seat of Escambia Co., situated on Pensacola Bay, an arm of the Gulf of Mexico. There is a good harbor and the city is a shipping point and commercial center served by steamships, bus and truck lines and two railroads. A United States Naval Air Station is located here. Shipping, naval stores and lumber products are the chief industrial interests. There are also many manufactures. In 1929 the factory output was valued approximately at \$6,000,000; the retail trade amounted to \$14,140,543. The vicinity of Pensacola is a rich agricultural region producing fruit, potatoes and various other crops, particularly citrus and deciduous fruits. Pensacola was founded in 1559 by Don Tristram de Luna and incorporated in 1828. Pop. 1920, 31,035; 1930, 31,579.

**PENSHURST PLACE**, an imposing quadrangular mansion, dating from the 14th century, famous as the birthplace of the poet SIR PHILIP SIDNEY (1554-86), in the village of Penshurst, 5 mi. southwest of Tunbridge, Kent, England. Of greatest interest in the mansion are the chapel, the portraits of the Sidney family, and the "great hall," 64 ft. long, with its minstrels' gallery, central hearth and open timber roof. There is a fine courtyard and an extensive park. Algernon Sidney, the noted 17th century politician, is buried at Penshurst Place; Sir Philip, however, is buried in St. Paul's Cathedral, London.

**PENSIONS**, regular periodic payments for past services, which originated from courts and the mili-

tary service, but now affect practically all vocations in which services are rendered for WAGES. They now even support mothers, the blind, and workers during non-earning periods. Pensions are found in almost all countries of North and South America, Europe, the Balkans, and South Africa, and in Australia and Japan. Among groups pensioned are military and naval men; government, state and municipal employees; teachers at all levels; ministerial, social, hospital, industrial and private workers for salaries or wages; and the aged, by many European governments and by some states of the United States.

Pensions provided without apparent cost to the beneficiary are to be distinguished from pensions toward the provision of which employer and employee contribute jointly. In economic theory, payments for pensions, whether free or contributory, are in time absorbed in salary scales, and ultimately the worker provides his own pension. Economically, though not yet legally in the United States, pensions are deferred pay.

More important, for any organization, is the distinction between pensions paid through direct cash disbursement from its income, and pensions paid from contributions accumulated at interest over a service period. On the cash disbursement basis, retiring pensions may total a third of the active pay roll. On the reserve basis, they can be so planned as never to cost more than a comparatively small fraction of the active pay roll. On the cash disbursement basis, a legal contract to pay a pension is practically impossible. On the reserve basis, both employer and employee can and ought to be protected by a legally enforceable contract. It is yearly being demonstrated that only the unlimited purse of a taxing government can long sustain the cost of pensions on the cash disbursement basis.

The primary justification for a pension and retirement system is advancement of the true interests of the service for which it operates. No pension system based on charity to the individual can be defended. The best modern non-governmental pension systems presuppose joint, equal contributions from employer and employee, throughout the service period; sound interest rates; adherence to conservative mortality and disability tables and date of withdrawal; benefits for superannuation, upon disability, for widows, and at separation from services; optional modes of paying retiring annuities; cooperative management; periodic actuarial and financial scrutiny of experience and resources; and legally enforceable contracts. These features characterize annuity arrangements, whether for individuals or for occupational groups, offered by the best life insurance companies.

A pension should be based on the active pay, but over the entire period of service. Basing pensions on salaries paid in the last year of active service, or final average salaries over the last five or ten service years, is probably the most dangerous single provision in all pension practice. Of late, attention has been invited to the theory that appropriate provisions for

industrial retirement may include an actuarially grounded subsistence pension at a flat rate for all employees, plus certain insurance benefits, plus an income acquired through equitable division and sound investment of business profits. H. J. S.

**PENSIONS, BUREAU OF,** handles military and civil pensions granted by the United States, and is under the jurisdiction of the Department of the Interior. It adjudicates all claims to pensions for military service, arising under laws of Congress passed before Apr. 6, 1917 and after July 2, 1921; it considers claims made for the last illness and funeral expenses of deceased pensioners and handles annuities and refunds for retired employees of the classified civil service. The Bureau is headed by a commissioner who is assisted by clerks, medical referees and attorneys.

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**PENSIONS, GOVERNMENTAL.** In continental Europe, pensions for civil servants, teachers, judges, and others in governmental employ are often paid by the state and are closely related to a rigid state control of training, appointment, salary and tenure. Some of these systems are joint contributory. All free governmental pensions are so much valued that they have tended to keep salaries unduly low. Military pensions are properly rewards for faithful and long service in the armed forces of a nation; they are to be distinguished in principle from soldier's bonus and so-called adjusted compensation. The United States Civil Service Retirement System (1920, 1926) is a joint contributory plan, under actuarial supervision, without full reserves and with a low limitation upon the amount of the retiring allowance. The Federal Government now contributes its share of the pension cost.

Various states of the Union have pension and retirement systems for state employees. Teachers pension systems, mainly on the joint contributory reserve basis, are found in 23 states. Local municipal firemen's and police pension systems operate usually on the cash disbursement basis and do not soundly provide the benefits they promise. H. J. S.

**PENSIONS, MOTHERS'. See MOTHERS' AID.**

**PENSIONS, OLD AGE.** Payment of governmental pensions to aged persons is now the universal practice throughout the industrial world. The INDUSTRIAL REVOLUTION has made the life of the aged worker extremely insecure. Specialized machine industry necessitating speed rather than skill and experience has made the older worker a poor competitor for a job. Workers' earnings rarely make possible savings for old age. Since few aged workers avoid dependency, the state has assumed its obligation to secure them with at least a small degree of honorable and decent comfort as a reward for services previously rendered.

Every industrial nation in the world, except the United States, has established either gratuitous old age pensions or a system of insurance whereby employers, employees and the government contribute to

a special fund out of which pension payments are made. Approximately 700,000,000 people in about 40 nations are now protected in old age by these plans. In 25 countries the system is contributory; 12 foreign nations and 13 of the United States follow the straight pension plan. Germany was the first to establish a contributory system in 1889. Denmark followed with a non-contributory plan in 1891. Great Britain's non-contributory plan of 1908 was changed in 1925 to a wider and more inclusive contributory system.

The first official study of the problem in the United States began in 1927 in Massachusetts. Similar commission studies followed in Wisconsin, Pennsylvania, Ohio, Montana, Indiana, Virginia, California, New York, New Jersey, Delaware and Michigan. The first old age pension law in the United States was adopted in Arizona in 1914. This act was declared unconstitutional. The territory of Alaska followed in 1915. Montana, Nevada and Pennsylvania enacted laws in 1923. The Pennsylvania act was declared unconstitutional in 1925. Then followed Wisconsin in 1925; Kentucky, 1926; Maryland and Colorado, 1927; California, Utah, Minnesota and Wyoming, 1929; and New York and Massachusetts, 1930. Delaware enacted a law in 1931.

The following states were paying pensions in 1931 either on a state-wide or county basis: Montana, Utah, California, Wisconsin, New York, Minnesota and Massachusetts. In the other states the laws have not been operative. About 50,000 persons were estimated to have been pensioned in the United States by the end of 1931.

In Utah, Maryland and Delaware the pensionable age is 65 years. In the other states the age is 70. The main qualifying requirements under the American laws are economic need, United States CITIZENSHIP and residence in the state from 5 to 20 years. Children must continue to support their parents when able to do so.

New York and Massachusetts leave the pension amount to the discretion of the administrative officials. The maximum under the other American laws range from \$250 to \$365 a year. California, Wisconsin, New York and Massachusetts share the cost with the counties. In Delaware the state pays the entire amount. In the other states, the funds come entirely from the counties. A. E.

**PENSIONS, WAR. See WAR PENSIONS.**

**PENTAGON,** a polygon of five sides. The regular pentagonal star was the symbol of the Pythagorean brotherhood. *See* POLYGON.

**PENTANE,** the fifth member of the paraffin series of HYDROCARBONS (*see* PARAFFIN COMPOUNDS). Normal pentane has the chemical formula  $C_5H_{12}$ . It is a liquid under ordinary conditions, melting at  $-129.9^\circ C$ ; normal boiling point,  $36^\circ C$ . The specific gravity of the liquid is 0.6312. Pentane is a component of crude PETROLEUM and NATURAL GAS. It is produced commercially by the fractionation of natural GASOLINE, and is used as a solvent and as a raw material for the synthesis of various organic chemicals. Most of the pen-

tane present in natural gas and crude petroleum, however, is incorporated in motor fuel.

G. G. BR.; M. SO.

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**PENTATEUCH, THE**, the first five books of the Bible: Genesis, Exodus, Leviticus, Numbers and Deuteronomy. These are now commonly included in the Hexateuch, which is the name which modern biblical scholars have given to the first six books of the Bible, believed by many to form one literary whole. The old tradition that the Pentateuch was the work of Moses is slowly being abandoned in favor of the belief that it is the result of a complicated literary process extending over many centuries.

**PENTATONIC SCALE**, in music, a five-tone scale found in both Celtic and Chinese music. It may be readily produced on the black keys of the PIANO-FORTE, beginning on G flat to produce the major mode, and on E flat to produce the minor.

**PENTECOST**, or Whitsunday, derives its name from a Greek word meaning fiftieth. Among the Jews it was a solemn festival observed on the 50th day (seven weeks) after the Passover, hence often called "The Feast of Weeks." At this festival an offering of the first fruits of the land was made, although by the later Jews the festival was thought to commemorate the gift of the law on the 50th day after the Exodus. Some scholars hold that its agricultural origin may indicate that it was instituted by the Canaanites. In Christian churches it commemorates the descent of the Holy Ghost on the apostles, which occurred at Pentecost. The gifts of first fruits were changed to donations to the clergy and called Pentecostals. At the church celebrations in the Middle Ages, doves and rose leaves were sometimes released from the roof on the congregation as a symbol. The day became one of the three great baptismal seasons and the white garments of the candidates accounts for the day's being called Whitsunday.

**PENTELICUS**, a mountain of Attica in Greece, 3,640 ft. high, 10 mi. northeast of Athens. Pentelicus is a spur of Mt. PARNASSUS running in a southeasterly direction between Athens and Marathon to the coast. The celebrated white marble of Pentelicus furnished the marble for the Parthenon and for many of the sculptures of Athens.

**PENTLANDITE**, the most important ORE of NICKEL. It is a sulphide of iron and nickel, with a metallic, bronze-yellow appearance, and crystallizes in the ISOMETRIC SYSTEM. The ORE DEPOSITS supplying nearly all the world's nickel are found near Sudbury, Canada, where the pentlandite, CHALCOPYRITE and PYRRHOTITE were originally constituents of a NORITE rock in which they were segregated as offshoots and masses as the magma cooled. Some platinum is found in these deposits, and the chalcopryrite is an important ore of copper. Nickel is used in alloy steels and other alloys, for plating other metals to give them a hard, non-tarnishable coating, and in the fabrication of tools, utensils and metal trim and decorations.

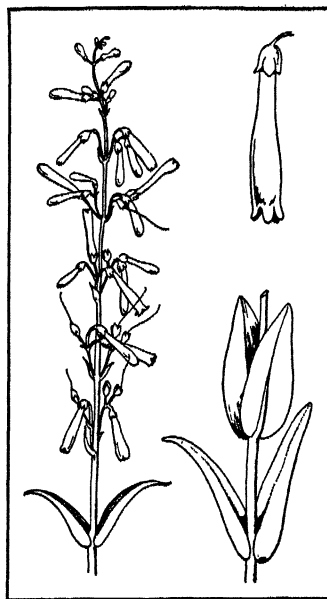
**PENTODE**, an electronic tube (see TUBES, ELECTRONIC) employing three GRIDS in addition to the CATHODE and PLATE. Two of the grids are used in the same manner as the two grids of a tetrode, or SCREEN-GRID TUBE. One serves as the signal grid, while the other, placed between this grid and the plate, serves as an electrostatic shield between these two electrodes. The third grid in the pentode is placed between the screen grid and the plate and is kept at the potential of the FILAMENT. It serves to repel to the plate any electrons which may have been emitted there as a result of bombardment of the plate by the electrons reaching it from the cathode.

The pentode is used primarily as an output tube since it is capable of delivering more power for a given signal voltage than three-element power tubes.

With somewhat different uses of the respective grids, the pentode may also be used as an amplifier, especially for RADIO FREQUENCIES, and should show greater AMPLIFICATION than the conventional screen-grid tube.

L. G. H.

**PENTSTEMON**, a large genus of perennial herbs and shrubs of the figwort family comprising many garden ornamentals grown for their showy flowers. There are about 150 species, all, except one, found in northeastern Asia, natives to North America and



FROM JEPSON, MAN. FL. PLANTS CALIF., COPYRIGHT

SCARLET BUGLER

Flowering spike, portion of leafy stem and flower (upper right)

Mexico. Upward of 135 species occur in the United States, including some of the most handsome American wild flowers. They are most numerous from the Rocky Mountain region westward, but several beautiful species grow in the eastern states. They are usually erect, slightly branched plants with oppo-



site leaves and large, tubular, two-lipped flowers borne in terminal clusters. There are four anther-bearing stamens and a conspicuous sterile one which is frequently dilated or bearded, whence the widely used common name beardtongue. Among the most attractive native species more or less cultivated are the scarlet bugler (*P. centranthifolius*), the bearded bugler (*P. barbatus*), and the climbing bugler (*P. cordifolius*), all with brilliant scarlet flowers; the bushy beardtongue (*P. antirrhinoides*), with yellow flowers; the blue beardtongue (*P. cyananthus*); the cobaea beardtongue (*P. Cobaea*), with purple flowers, and the foxglove beardtongue (*P. Digitalis*), with white flowers.

**PENUMBRA**, or half-shadow, that part of the shadow of the earth or the moon where only part of the sunlight is cut off. During a total eclipse of the sun, the penumbra of the moon strikes those places on the earth where the eclipse is partial.

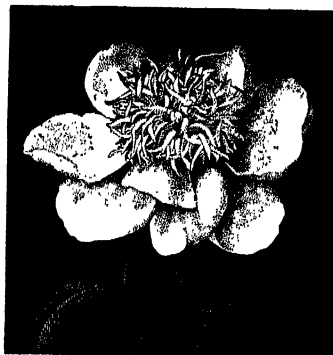
**PENUTIAN**, a North American Indian linguistic stock, formed by Kroeber and Dixon by the combination of five stocks originally considered distinct. They are the Wintun (Copehan), Maidu (Pujunan), Yokuts (Mariposan), Miwok (Moquelumnan) and the Costanoan. The combination is based on similarities not recognized when the original linguistic classifications were made and is not accepted by all authorities. The territory originally occupied by the groups closely approximated the drainage of the great interior valley of California, and in 1770 its members were estimated at 50,000.

**PENZA**, administrative center of the Penza district in the Middle Volga Region of the R.S.F.S.R. in south central European Russia. The Penza and Sura rivers meet here and railroads go through the town. These means of transportation make it possible for Penza to ship out lumber, farm products, grain, sheep and cattle. A large paper mill is the principal industrial support of the town, although there are also sawmills and match factories. The city was founded as a fort about 1663 to protect Muscovy against Nomad attacks and was a revolutionary center during Pugachev's uprising in 1774. It became the provincial capital in 1796. Penza has several museums and a botanical garden. Pop. 1926, 91,924.

**PENZANCE**, the westernmost seaport of England, situated in Cornwall, England, about 325 mi. southwest of London on Mount's Bay across from St. Michael's Mount. Because of its mild climate, suitable even to the cultivation of exotic plants, Penzance is something of a holiday resort. The old town dates as a fishing village from the 14th century, and, devastated by Spaniards in 1595, has but few ancient buildings surviving. The ruins of an old baptistry nearby boast a wishing well, and Megaliths are common in the vicinity. Modern Penzance has a fine esplanade and handsome public buildings and grounds. In the 24-acre harbor are two floating and drydocks that aid a lively shipping trade and fishing industry. Pop. 1921, 12,087; 1931, 11,342.

**PEONAGE**. In many parts of Latin America the rural workers are called *peones* or peons. For the most part they are Indians or mestizos of the lower class, ignorant and poor. In colonial times the relationship between the Indian and mestizo laborers and the landed proprietors was somewhat regulated by the *encomienda* system. This was abolished in the 18th century, and another régime often called peonage evolved. In order to insure a permanent and cheap labor supply the large landed proprietors not only paid their hands very small wages but virtually forced them to buy their necessities and luxuries from the estates' own stores. The prices were high and the cost for the barest necessities often exceeded the peon's income. He went into debt, and according to laws in existence in many of the Latin American countries the creditor had rights in the debtor's person and property until the debts were cancelled. Many of the proprietors saw to it that the debt could not be paid and that its burden should fall on the children and grandchildren. Thus they were able to keep the peon in virtual slavery and his descendants as well.

Peonage existed because of the great power of the landed aristocrats, of the ignorance and helplessness of the peons themselves, who had nowhere else to turn for work, and because the existing social and economic conditions made some such device well nigh obligatory to insure labor supplies on estates which were poorly managed and generally unproductive. With the modernization of agricultural technique and the enlightenment of the peons radical changes in the system have occurred. In some countries peonage has been abolished by law and in others great social upheavals occurred to better the lot of the landless



JAPANESE PEONY

and "debt serfs." Peonage was perhaps more widespread as an institution in Mexico and Ecuador, though it existed in Bolivia, Peru, Chile and Guatemala well into the first decade of the 20th century. With the exception of the last country named it is losing its hold and tends to disappear as a labor system.

P. V. S.

**PEONY** (*Paeonia*), genus of vigorous perennials and subshrubs of the crowfoot family yielding many

of the most showy and handsome flowers in garden cultivation. There are about 25 species native to the Northern Hemisphere but most numerous in Asia. The erect stems, rising from tuberous or thickened roots, bear much divided leaves and large, red, purple, white or yellow flowers, usually solitary but sometimes clustered. Nearly all the species have been more or less cultivated. The immense number of gardeners' forms have been developed from a very few species, chiefly from the white peony (*P. albiflora*), native to eastern Asia, and the red peony (*P. officinalis*), native to southern Europe and western Asia. From these two have been derived fully 1,000 recognized and named horticultural varieties. The tree peony (*P. suffruticosa*), a small shrub 3 to 5 ft. high, native to



TREE PEONY

China and long cultivated in numerous varieties, bears often double, red, rose-red or white flowers. A single wild peony (*P. Brownii*) occurs in the western United States.

**PEORIA**, a North American Indian tribe speaking a dialect of the Algonkian linguistic stock. They were one of the chief tribes of the Illinois Confederacy and lived in Illinois and Missouri. In the middle of the 18th century they were practically annihilated by the Fox as revenge for aiding the French and other tribes against the Fox tribe. Land claims in Illinois and Missouri were sold to the United States government in 1832 and the tribe moved to a reservation on the Osage River in Kansas and in 1868 to Indian Territory in Oklahoma.

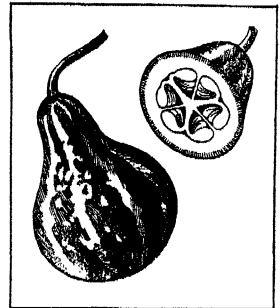
**PEORIA**, a port city in north central Illinois, the county seat of Peoria Co. It is situated on the Illinois River where it broadens to form Lake Peoria, 160 mi. southwest of Chicago. Peoria is an inland port served by river craft, bus and truck lines, airplanes and several railroads. It is a shipping and manufacturing center in the corn-growing belt. In 1929 the factory output was worth about \$66,000,000; the chief products are commercial solvents, washing machines, farm tractors and corn products. In 1929 the wholesale trade proper amounted to \$58,088,725; the retail trade, to \$70,361,575. It is the seat of Brad-

ley Polytechnic Institute. Ft. Crève Coeur, established by La Salle and his companions in 1680, was built on the opposite bluff of the river from the present city. Peoria was first known as Opie. It was incorporated as a city in 1891. Pop. 1920, 76,121; 1930, 104,969.

**PEPIN, LAKE**, an expansion of the upper Mississippi about 30 mi. south of St. Paul, Minn., on the boundary between Minnesota and Wisconsin. The lake is about 30 mi. long and from 1 to 2 mi. wide. Limestone bluffs 400 ft. high and grotesquely eroded form the walls of the lake. The surrounding region is highly scenic and excellent roads attract many visitors. The town of Red Wing is situated at the north end of the lake.

**PEPIN** or **PIPPIN**, the name of three members of the Carolingian line in France. Pepin I served under the Frankish king, Dagobert I, as mayor of the palace, and was influential in forming governmental policy. He died in 639. Pepin II (d. 714) gained control of the eastern territory of the Merovingian Franks, and successfully waged war against the neighboring states of the Frankish kingdom. Pepin III, called Pepin the Short, was the greatest of the three. He was the son of CHARLES MARTEL, and became King of the Franks in 751 after the abdication of his brother who had ruled jointly with him. Pepin was of great assistance to Pope Stephen II in a war against the Lombards and, by giving the pontiff territory in Italy, established what were to be the first Papal States. In 760 he began a long campaign which ended with his gaining complete control of AQUITAINE, and later fought the Saxons with, however, indifferent success. Pepin died in 768, giving his greatly extended kingdom to his two sons, Carloman and CHARLES THE GREAT.

**PEPO**, a fruit characteristic of plants of the gourd family, exemplified by the melon, pumpkin, and cucumber. It is a modified type of berry, with a hard rind and fleshy pulp, bearing numerous seeds on placenta which project into the hollow center, as in the muskmelon or cantaloupe, or completely fill the fruit, as in the watermelon. In others, the placenta meet in the middle and recurve, forming a falsely three-celled fruit.



COURTESY N. Y. BOTANICAL SOCIETY

PEPO (*Cucurbita Pepo*)

**PEPPER, GEORGE WHARTON** (1867- ), American lawyer and author, was born at Philadelphia, Pa., Mar. 16, 1867. He was admitted to the bar in 1889. After four years of practice he served as Biddle professor of law at the University of Pennsylvania in 1893-1910. He is the author of important legal works and in 1924 published *Men and Issues*. In 1922 he was appointed United States Senator to take the place of Penrose, and remained in office until 1927.

**PEPPER, WILLIAM** (1843-1898), American physician, born in Philadelphia on Aug. 21, 1843. He was educated at the University of Pennsylvania, graduating in medicine in 1864. He described the changes in the bone marrow in pernicious anemia, and is particularly noted for editing of the first large American *System of Medicine*. He devoted much of his time to the University of Pennsylvania, improving greatly the facilities for medical education in that institution. He died on July 28, 1898, at Pleasanton, Calif.

**PEPPER**, a name given to various pungent spices, used as condiments, the most important of which are known as black, white and red or cayenne pepper. The common black pepper of commerce is the dried fruit of a perennial climbing shrub (*Piper nigrum*) of the pepper family. It is a native of forests in the oriental tropics, widely cultivated and naturalized in warm regions, as Java, the Philippines and the West Indies. From its ivy-like habit is also called pepper vine. The strong stems bear broad, roundish, somewhat heart-shaped leaves, numerous flowers in slender spikes and yellowish-red berries about  $\frac{1}{4}$  in. in diameter. The berries, gathered and dried in the sun before fully ripe, are marketed in bags of 60 lbs. and upward. White pepper, much less pungent but of finer flavor than the black, is prepared from the fully ripe fruits, though some forms are made by removing the dark outer layer from the dried black pepper. Red or **CAYENNE PEPPER** is prepared from the fruit of tropical American species of *Capsicum*. Ashanti pepper (*P. Clusii*), similar to black pepper, and Melegueta pepper (*Amomum Melegueta*), allied to the ginger, are widely used in tropical Africa.

**PEPPER BUSH, SWEET** (*Clethra alnifolia*), a handsome shrub of the white-alder family called also white- or spiked-alder. It is found in wet soils, chiefly near the coast, from Maine to Florida and Mississippi, and often planted for ornament. The bushy stems, 3 to 10 ft. high, bear oblong sharply toothed leaves and attractive white flowers in numerous narrow erect clusters. The similar but larger mountain sweet pepperbush (*C. acuminata*) occurs from Virginia to Georgia.

**PEPPERGRASS**, the general name for a numerous genus (*Lepidium*) of the mustard family. There are about 100 species comprising annuals, perennials and subshrubs widely distributed throughout the world. Of these about 20 occur in North America, many of which are common weeds. They are usually small, much branched plants with inconspicuous flowers and very numerous flattened seed pods. The golden peppergrass or garden cress (*L. sativum*), a native of Asia, is widely cultivated, especially in Europe, as a salad plant.

**PEPPERIDGE**, a name given, especially in the eastern United States, to the TUPELO or black gum, a handsome tree of the nyssa family with foliage that turns brilliant red after the first autumn frosts.

**PEPPERMINT** (*Mentha piperita*), a pungent, aromatic, perennial herb of the mint family yielding

a valuable essential oil widely used in flavoring and in medicine. The plant, a native of Europe, is widely cultivated and naturalized in various parts of the world. It grows 1 to 3 ft. high with smooth branching stems, narrow, sharply toothed leaves, dotted with minute oil globules, and small purplish flowers in dense clusters. Hippocrates, Aristotle, Theophrastus and other noted ancient Greek writers described the medicinal virtues of this plant. Peppermint oil is obtained from the dried leaves chiefly by distillation. The commercial cultivation of the plant, which was undertaken in England about 1750, has been developed in several other countries, but especially in Japan and in the United States. The peppermint-growing districts of southern Michigan and northern Indiana contribute a large part of the world's output of peppermint oil.

**PEPPERRELL, SIR WILLIAM** (1696-1759), American colonial soldier, was born in Kittery, Me., June 27, 1696. He continued his father's shipbuilding and trading activities, and he took a prominent part in both military and civil affairs of the Massachusetts province, of which Maine was a part. In **KING GEORGE'S WAR** he commanded the troops which captured Louisburg in 1745; and in the **FRENCH AND INDIAN WAR**, he served as a major-general, commanding the forces which guarded the New England frontier. He served on the governor's council in 1727-59 and was chief justice of the court of common pleas from 1730 until his death at Kittery, Me., on July 6, 1759.

**PEPPERS, SWEET**, the name given to cultivated forms of a variety of red pepper (*Capsicum frutescens* var. *grossum*), called also garden peppers, bell peppers and pimentos and grown for their large, puffy, thick-fleshed fruits marketed usually as a green vegetable. The garden pepper is a stout, sparingly branched annual, about  $2\frac{1}{2}$  ft. tall, bearing large oblong leaves, whitish flowers, and red or yellow oblong or bell-shaped to apple-shaped or tomato-like fruit, depressed at the base and often furrowed on the sides, with firm, mild-flavored flesh. In the United States, the production of peppers as a market vegetable, of slight consequence before 1900, has become, especially since 1910, of importance, surpassing in value that of beets, carrots, cauliflower, and other vegetables of long-established use. Peppers are grown chiefly in the South, in California and in New Jersey. According to the Census of 1930 five states produced three-fourths of the total commercial crop, namely: Florida 31%, California 18%, New Jersey 13%, Georgia 7.2%, and Louisiana 6.9%. The increasing popularity of peppers is shown by the following table:

**PEPPERS, COMMERCIAL CROP, UNITED STATES  
1909-1929**

Year	No. Farms	Acreage	Value of Crop, \$
1909.....	1,641	3,483	408,741
1919.....	7,605	15,290	3,079,285
1929.....	14,907	30,416	4,804,248

**PEPPER TREE** (*Schinus Molle*), a handsome evergreen tree of the sumach family called also Peruvian mastic-tree. It is a native of the American tropics, much planted for ornament, especially in California. The tree grows about 20 ft. high with graceful dropping



PEPPER TREE  
Fruit and leaves

ping branches, narrow pinnate leaves of many leaflets, yellowish-white flowers and small rose-colored aromatic fruits in pendant clusters.

**PEPPER VINE**, a name given the southern United States to a highly ornamental species of *Ampelopsis* with finely divided leaves and blackish-purple fruit. See AMPELOPSIS.

**PEPTIC ULCER.** See GASTRIC ULCER; also DYSPEPSIA.

**PEPYS, SAMUEL** (1633-1703), English diarist, was born in London, Feb. 23, 1633, the son of a tailor. He attended St. Paul's School, London, married Elizabeth Marchant, the daughter of an exiled French Huguenot, in 1655, and in 1660 graduated at Cambridge with an M.A. degree. Pepys's career commences in 1660 in a threefold sense, for in that year he started his famous diary, began the collection of his valuable library, and in that year also became a clerk in the Navy Office, London. As a government official he rose to considerable eminence. He was closely associated with the Lord High Admiral, the Duke of York, who later became King James II, and traveled with the duke on several official missions. In 1673 he was made Secretary of the Admiralty; he was accused of Catholic connivance in 1679 and for a short time was imprisoned in the Tower; he was reappointed to the secretaryship in 1684, and in 1689 was finally dismissed from his duties. He had sat in Parliament for Harwich in 1679 and in 1685, and had been Master of the Trinity House in 1676 and again in 1685. Pepys's last years were spent in Clapham, London, where he died May 26, 1703.

To outsiders Pepys no doubt appeared as a grave-mannered, hard-working government official, a diligent, capable man. But this "Philistine" kept a diary, beginning Jan. 1, 1660, and ending May 31, 1669, and here he revealed a being whose existence was unsuspected. For this diary is a complete record of a man's outward and inner life, omitting nothing, no matter how trivial, contemptible or otherwise odious. It records important national events like the first Dutch War, the Plague or the Great Fire of 1666; it has much to say about the personalities of the great men and women of the day and it catches faithfully the sights, sounds and odors of the teeming streets of London. But what makes the diary unique is the utter candor with which Pepys set down the

details of his own life, his food, drink, his wearing apparel, what he did at taverns, his thoughts in church or at the theater, his illnesses, his loves and jealousies. He wrote for his own pleasure and for himself alone, trusting that no one would ever decipher the complicated shorthand in which he recorded his life and the times. The style is as intimate, racy and individualized as English literature has ever produced. Pepys's diary was first transcribed about 1820 by Rev. John Smith, and was first published in 1825 by Richard Griffin Neville, 3rd Lord Braybrooke. See also DIARY; ENGLISH LITERATURE.

**BIBLIOGRAPHY.**—*The Diary of Samuel Pepys*, transcribed by Rev. Mynors Bright and ed. by H. B. Wheatley, 1924; H. B. Wheatley, *Samuel Pepys and the World He Lived In*, 1880; A. A. W. H. Ponsonby, *Samuel Pepys*, 1928.

**PEPYS' DIARY.** See PEPYS, SAMUEL.

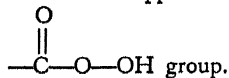
**PEQUOT**, a North American Indian tribe speaking a dialect of the Algonkian linguistic stock. This warlike tribe lived principally in Connecticut and was the terror of the English colonists. The murder of a trader precipitated the Pequot War in 1637. The principal Pequot fortification was surrounded and set fire to by the Colonists and about 600 Pequot men, women and children perished in the flames or were shot down while trying to escape. Captives were held as slaves or sent to the West Indies. At last the remaining members of the tribe threw themselves on the mercy of the English and were apportioned to various tribes but forbidden to call themselves Pequot. They were so harshly treated by their Indian masters that in 1655 the Colonial Government gathered them in two villages near the Mystic River.

**PEQUOT WAR**, 1637, a conflict between the Puritans in the Connecticut valley and the Pequot Indians. The Puritan migration into Connecticut crowded the Pequots between the white settlements and the hostile tribes of the Narragansett Confederacy. After the hard-pressed Pequots had committed several acts of violence, the Puritans of Massachusetts and Connecticut cooperated in a warfare of extermination. The Pequot stronghold, near the Mystic River, was a circular stockade enclosing 70 wigwams. At dawn, May 26, 1637, 200 white invaders, under Captains Mason and Underhill, circled the stronghold and fired the thatched wigwams. Narragansett Indians, who had not participated in the attack, assisted the Puritan force in the subsequent slaughter. Over 600 Pequots were killed; only seven escaped.

**PER-ACIDS AND PER-SALTS.** Inorganic per-acids may be theoretically considered as the acids derived by the chemical addition of water to the highest oxides of non-metals, although it is often impossible to prepare them in this manner. For example, the anhydride of perchloric acid,  $\text{HClO}_4$ , is chlorine heptoxide,  $\text{Cl}_2\text{O}_7$ , the highest oxide of chlorine, and the acid may actually be prepared in accordance with the following reaction:



Organic per-acids are supposed to contain the



Per-salts are salts of actual or hypothetical per-acids.

Examples are tabulated below:

PER-SALT		CORRESPONDING PER-ACID	
Name	Formula	Name	Formula
Potassium Permanganate	$\text{KMnO}_4$	Permanganic Acid	$\text{HMnO}_4$
Potassium Perchromate	$\text{K}_2\text{Cr}_2\text{O}_8$	Perchromic Acid	$\text{H}_2\text{Cr}_2\text{O}_8$
Silver Periodate	$\text{AgIO}_4$	Periodic Acid	$\text{HIO}_4$
Sodium Perborate	$\text{NaBO}_3$	Perboric Acid	$\text{HBO}_3$
Potassium Percarbonate	$\text{K}_2\text{C}_2\text{O}_6$	Percarbonic Acid	$\text{H}_2\text{C}_2\text{O}_6$

True per-salts should be distinguished from salts which contain hydrogen peroxide of crystallization, such as  $\text{Na}_2\text{SO}_4 \cdot 9\text{H}_2\text{O} \cdot \text{H}_2\text{O}_2$ . O. R.

**PERAK**, one of the Federated Malay States under British protection. It lies on the western coast of the MALAY PENINSULA and has an area of 7,800 sq. mi., largely covered with forests and jungle. The principal products are rice, rattans and tin. Lately the cultivation of rubber has been introduced. Taiping is the capital of the state. The population, according to the 1921 census, was 599,055, almost one half being Chinese and the rest Malay and Indian.

**PERCENTAGE**, an ancient branch of business arithmetic. An example of its early use is seen in the *centesima rerum venalium*, a tax of one hundredth (*centesimus*, hundredth) or 1% levied by Augustus Caesar on goods sold at auction. The word comes from *per centum*, by the hundred. Percentage had a prominent place in the Italian arithmetics of the 15th century, which set the standard for the business arithmetic of much of Europe and later of America. The early symbol for per cent was p cento or pē, the ē being the origin of the present %. It should be observed that 6% is, in the United States, merely another way of writing the decimal fraction 0.06. In Europe, however, expressions like £5 per cent. are common and "per millage," with the symbol 0/00, is occasionally used.

**PERCENTILE**, in statistics, a point below which the designated per cent of individuals of a series has not been reached. Thus, in the case of the 10th percentile 10 per cent of the individuals are on one side of it, and 90 per cent on the other. See STATISTICS.

**PERCEPTION**, the process of becoming aware of an object. Perception is sensation with meaning. It is not perfected until meaning has become satisfactory. There is no hard and fast line between sensation and perception, the two merging imperceptibly into each other. Nor is a bare sensation ever fully experienced. The "big, blooming, buzzing confusion" to which the infant is subjected probably comes as close to the level of pure sensation as it is possible to reach. But even this experience doubtless possesses some meaning.

An ordinary act of perception is so immediate and direct that it seems as if it were an unlearned response. Nevertheless there is much learning involved in perception. A young child would see no incongru-

ity in reaching for the moon, since it would have no conception of space relations. Without any conception of cow, a cow would not be perceived. Perception thus involves conception. Memory is so quick in the recognition of percepts that we forget that it is brought into play even in connection with the most simple kind of perception, such as the recognition of a chair. But let it once fail at this point and its rôle in perception becomes apparent. We see with what we have seen. Percepts have meaning according to our past experiences.

**PERCEPTS**, a mental content derived from immediate sensory stimulation. Percepts are particular and concrete, as distinguished from concepts which are abstract and universal. Percepts represent an interaction between organism and environment. Into the stimulus the mind reads its past experience, and percepts have meaning according to the amount of experience that is brought to bear upon them. A botanist, an artist and a clergyman do not all see the same flower when it is presented to them. To the botanist it has a certain structure, to the artist it is an object of beauty, while the clergyman may see in it the hand of God. Each perceives the flower on the basis of his interest. This interest not only interprets the individual's percepts but is in a large measure responsible for the objects that are to become percepts to him. Any number of sensory stimulations may be present, but unless the mind is attuned to receive them they do not become percepts.

**PERCEVAL, SPENCER** (1762-1812), English statesman, was born at London, Nov. 1, 1762, second son of John, second earl of Egmont. As a Pitt supporter he entered Parliament in 1796, and in 1802 became Attorney-General in the Addington administration. He was appointed Chancellor of the Exchequer in 1807, and two years later became Prime Minister and First Lord of the Treasury. He continued in office until his assassination by a lunatic in the lobby of the House of Commons, May 11, 1812.

**PERCH**, a name applied to various fishes with perchlike bodies, often of very different families. The true perches comprise an important family (*Percidae*) of spiny-rayed, fresh-water fishes found in the Northern Hemisphere, embracing the perches, pike perches and numerous small fishes many of which are called darters. The yellow perch (*Perca flavescens*), found widely in lakes and streams in eastern North America and introduced on the Pacific slope, is a handsome fish, usually somewhat less than a foot long and a pound in weight, with an elongate compressed body and an elevated back. In color it is olive green above, yellow on the sides marked with black transverse bands, and yellow or orange on the lower fins. It is prized as a game fish and its flesh is of fair quality. In 1929 the total commercial catch in the United States amounted to 8,364,000 lbs., valued at \$498,000. See also DARTERS; PIKE-PERCH.

**PERCH**, a unit of linear measure equivalent to one rod,  $5\frac{1}{2}$  yds. or  $16\frac{1}{2}$  ft.; sometimes, a square meas-

ure equal to one square rod or  $30\frac{1}{4}$  sq. yds.; also, a cubical measure of stone, usually  $16\frac{1}{2}$  ft. by  $1\frac{1}{2}$  ft. by 1 ft. In a general sense, *perch* is used of a pole, such as is placed in shallow water as a mark for navigators; also, a pole, rod or the like on which birds roost.

**PERCHLORATES**, salts of perchloric acid, characterized by the radical  $\text{ClO}_4$ .

*Perchloric acid*,  $\text{HClO}_4$ , in aqueous solution is quite stable and similar to sulphuric acid,  $\text{H}_2\text{SO}_4$ . Perchloric acid is used in the manufacture of esters, in electrolytic deposition of lead and in medicine.

*Perchlorate salts* are not affected by reducing agents and are more stable than chlorates. They are generally soluble in water and many organic solvents, e.g., silver perchlorate ( $\text{AgClO}_4$ ) in benzene. They are prepared from (a) solution chlorate ( $\text{NaClO}_3$ ) and sodium chloride ( $\text{NaCl}$ ) by heating, (b) by electrolysis of sodium chlorate ( $\text{NaClO}_3$ ) solution. Barium perchlorate ( $\text{BaClO}_4$ ) and magnesium perchlorate ( $\text{MgClO}_4$ ), anhydrous or as the tri-hydrates, are among the best desiccants known. See also CHLORATES AND PERCHLORATES. R. B. M.

**PERCOLATION.** See EXTRACTION.

**PERCY**, a family prominent for 500 years in English history. It was founded in the north of England by William de Percy (c. 1030-96) a companion of William the Conqueror who was granted lands in Lincolnshire, Yorkshire and Hampshire. When the male line became extinct, the name was carried on through the marriage of Agnes, daughter of the third baron, to Josceline de Louvain, brother-in-law of Henry I, who assumed the name of Percy. Richard de Percy (c. 1170-1244) was one of the company of barons who obtained Magna Charta from King John. Henry de Percy (c. 1272-1315) was made governor of Galloway by Edward I. Lord Percy of Alnwick, who was created Earl of Northumberland in 1377 at the coronation of Richard II, later rebelled against Richard and succeeded in crowning Henry of Lancaster as Henry IV. With his son, Henry Percy, surnamed Hotspur, he again rebelled in an unsuccessful attempt to place Mortimer, Earl of March, on the throne. By this act he forfeited his titles, but they were restored to his grandson in 1414, by Henry V.

**PERCY, SIR HENRY** or **HARRY HOTSPUR** (1364-1403), English soldier, was born in England on Mar. 20, 1364. At an early age he won fame and the name of Hotspur in military engagements at the Scottish border. In the popular ballads he figured as a hero of Chevy Chase. He was killed during a rebellion against HENRY IV at the Battle of Shrewsbury on July 21, 1403.

**PERCY, THOMAS** (1729-1811), English churchman and antiquary, was born at Bridgnorth, Shropshire, Apr. 13, 1729. He was graduated from Oxford, and in 1753 became vicar of Easton Maudit, remaining with the parish until 1782. Meantime, at a friend's house he found a bundle of old manuscripts under a bureau, and upon these he based his famous *Reliques of Ancient English Poetry*. He retouched,

or finished, many of the poems, but in spite of his tampering with his materials, his collection had an immense influence on English poetry and on the revival of interest in medievalism. He became Dean of Carlisle, and Bishop of Dromore, in Ireland. He died at Dromore, Sept. 30, 1811.

**PEREDA, JOSÉ MARÍA DE** (1833-1906), Spanish novelist, was born Feb. 6, 1833, at Polanco, province of Santander, northern Spain. Most of his life was spent in his native village. He first made his name as a writer by contributing tales and sketches of provincial life to the local newspaper; these were later published as *Escenas Montañesas*, or *Scenes in Montaña*. Pereda's first novel, *Los Hombres de Pro*, or *Respectable Folks*, appeared in 1874; it dealt with the rise in the world of a country grocer. It was followed by *Don Gonzalo González de la Gonzalera*, 1878, also depicting provincial society, but especially accenting the political situation in Spain. Succeeding novels included *De Tal Palo Tal Astilla*, or *A Chip of the Old Block*, 1879; *El Sabor de la Tierra*, or *Redolent of the Soil*, 1881; *Pedro Sánchez*, 1883; *Sotileza*, 1884; *La Montañesa*, 1887; *Nubes de Estío*, or *Summer Clouds*, 1890; and *Peñes Arriba*, 1894. Among his other works are three volumes of tales and sketches, *Tipos y Paisajes*, 1870, *Bocetos al Temple*, 1873, and *Esbozos y Rasguenos*, 1880. Pereda's portraits of rustic people have hardly been surpassed. His vision was idealistic, yet balanced by a genuinely Cervantic sense of humor. A master of idiom, he wrote vividly, with telling force. The novelist died at Polanco, Mar. 1, 1906. See also SPANISH LITERATURE.

**BIBLIOGRAPHY.**—George Ticknor, *History of Spanish Literature*, 6th ed. 1891; J. Fitzmaurice-Kelly, *A New History of Spanish Literature*, 1926.

**PÈRE GORIOT**, a realistic novel of the COMÉDIE HUMAINE, by HONORÉ DE BALZAC; published 1835. This is the Lear-like tragedy of Old Goriot, a retired manufacturer who, after giving his whole life to the ambitions of his daughters, the Countess de Nucingen and the Baroness de Restaud, is despised and utterly neglected by these ungrateful women. The story of heartless cruelty is seen chiefly through the eyes of a young student, Eugène de Rastignac, an inmate of the sordid boarding-house, Maison Vauquer, in which Old Goriot is living out his last poverty-stricken years. Two minor characters are Vautrin, an escaped convict, and Madame de Beauséant.

**PEREGRINE PICKLE**, a humorous novel by TOBIAS SMOLLETT; published 1751. In this is included the *Memoirs of a Lady of Quality*, possibly by Lady Vane. Peregrine Pickle is a wealthy, selfish, vain young rake who owes many of his wild tendencies to his childhood association with Hawser Trunnion, his eccentric uncle. After some extravagant adventures in Paris, London and Bath, Peregrine tries to win Emilia Gauntlett, his childhood sweetheart, by force; but, angered by Emilia, he spitefully marries a beggar-maid. Losing his fortune in a political venture, he is imprisoned, though his father's death soon brings him

another fortune. At last, somewhat reformed, he marries the worthy Emilia.

**PERENNIALS**, are plants which normally live more than two years and bloom more than once, as distinguished from annuals and biennials. In regions with a winter resting season, perennials become dormant during the cold months, resuming their growth at the opening of spring from buds developed during the preceding summer. In shrubs and trees these buds are above ground on the stem and its branches, which increase in size from year to year. In herbaceous perennials the stems die to the ground each autumn and the buds for the following year's growth are situated at or beneath the surface of the soil. Tubers, bulbs, and rhizomes are common organs among perennials, not only bearing buds but also storing reserve food for the resumption of growth. In gardening, the term perennial is usually applied only to the herbaceous forms, excluding the trees and shrubs.

H. A. G.

**PÉREZ DE AYALA, RAMÓN** (1881- ), Spanish writer, was born at Oviedo, Aug. 9, 1881. RUBEN DARÍO greeted his first volume of poems, 1901, with rapturous enthusiasm. Pérez de Ayala's novels have evoked great praise for their purity of Castilian style, tempered by irony. His *Novelas Poemáticas*, 1916, revealed increasing talent, a promise confirmed in *Belarmino y Apolonia*, 1921.

**PÉREZ GALDÓS, BENITO** (1845-1920), Spanish novelist, was born at Las Palmas, Canary Islands, May 10, 1845. He studied law, but soon abandoned it to devote himself to writing. After writing many historical novels in the series of *Episodios nacionales*, he turned to the portrayal of contemporary life and to propagating his Liberal ideas. *Doña Perfecta*, perhaps his outstanding novel in the latter manner, was published in 1876. Pérez Galdós's realism changed to symbolism, though his main preoccupation was always style. The writer died at Madrid, Jan. 4, 1920.

**PERFECT GAS**, a gas which would always behave precisely in the way described by BOYLE'S LAW. In such a gas the molecules would occupy no space and would exert no forces upon one another except at the instant of collision. Neither of these conditions is true of any real gas. All gaseous molecules occupy space and all attract one another.

**PERFECT NUMBER**, a number which is equal to the sum of all its factors, including 1 but not the number itself. For example,  $6 = 1 + 2 + 3$  (= its factors) and hence is a perfect number. So far as known, such numbers are of the form  $\frac{1}{2} \cdot 2^p(2^p - 1)$ , where  $2^p - 1$  is prime. The theory began with the Greeks, being discussed by EUCLID and probably much earlier. See NUMBERS, THEORY OF.

**PERFUMES**. Perfumes are made from aromatic substances to produce pleasant odors. (For history see COSMETICS.) These substances are derived chiefly from vegetable, animal, and chemical sources.

In the vegetable group, aromatics are supplied by a variety of plants. In some plants, such as the rose, carnation or jasmine, the flowers contain the essential

part. In others, it is found in the leaves and stem, as in the geranium; or it may be in the fruit, as in the lime or lemon. Bark (cassia and cinnamon) and roots (sassafras) also furnish ESSENTIAL OILS. The orange tree is an example in which aromatic substances are derived from several parts of the plant—the blossom (oil of neroli), the peel (oil of orange); leaves and twigs (oil petitgrain). Bitter almond, anise, and nutmeg are aromatics derived from seeds. Gums, balsams and OLEO-RESINS, exudations of some plants, are also sources of aromatics.

The four animal sources of aromatics are ambergris, a grayish-white fatty substance which is secreted by the sperm whale; castor, a secretion of the beaver that accumulates in two pear-shaped sacs on the animal's abdomen; musk, found in a pod-like growth on the male musk ox; civet, a similar growth taken from the civet cat and muskrat which are the only animals raised for the purpose of producing aromatic substances.

Chemistry is the source of synthetic or "built up" perfume from other substances than the natural essential oils. However, some of the synthetics are derived from vegetable bases which chemically reproduce odors closely resembling the natural product. From heliotropin (oil of camphor), for instance, is derived the odor of heliotrope; beta-naphthol ether produces carnation odor, etc.

The methods used in separating the aromatic substances from flowers and plants varies according to the type of flower or plant in question.

*Distillation* is one of the oldest methods used in extracting the aromatic substances from plants. The earliest type of simple distilling with open fires is still used in certain sections of France. However, modern apparatus is more generally used.

*Expression* is a method used largely for separating the citrous oils from the peel of ripe citrous fruits, orange, lemon, lime and bergamot. This consists of breaking up, or bruising the pulp which readily gives up the portion containing the essential oils.

*Extraction* of the essential oils from flowers and plants is accomplished by three principle methods depending on the flower to be extracted: *enfleurage*, *maceration*, and by the use of *volatile solvents*.

For *enfleurage* the flower petals are placed on grease-covered frames until the grease absorbs the essential oil.

*Maceration* consists of immersing the flowers in vessels of hot fat which absorb the essential oils.

Volatile solvents, such as petroleum ether (sometimes disulphide of carbon and ether) is the most modern development in the process of extraction. The liquid petroleum ether passes through a series of vessels containing the flowers until the insoluble *plant waxes* or concretes have been separated. The next step is to remove from the concretes the *soluble waxes*. This is accomplished with strong alcohol which retains the soluble waxes. These soluble waxes are extracted from the alcohol by freezing, leaving the *absolute* flower oil.



Perfumery in the popular sense refers to alcohol solutions of essential oils blended to a given formula. The demand today is largely for bouquet odors, but in the case of all perfume the odor must have lasting quality. Therefore, "fixation" of odors becomes one of the most important steps in the manufacture of perfumery. For this purpose certain essential oils, termed *fixative*, have been found successful in holding or "bringing out" the desired odor. These fixatives may be any of animal source, vegetable source such as clary, sage, patchouli, and balsams, OLEO-RESINS and GUMS. Fixatives in the chemical group are many and new synthetic aromatics are constantly added to the list. Some of these synthetics have no odor of their own, but are employed because they render the blended odor more tenacious.

*Toilet waters* are weaker solutions of the alcohol perfumes. That is a greater proportion of alcohol than is used to the amount of essential oils. However, other toilet waters are the colognes, such as eau de cologne, Florida and Hungary waters which are made from standard formulas.

*Solid perfumes* are pomades and waxes which hold the perfume in concentrated form. There is very little demand for this type of perfume.

See also BATH PREPARATIONS.

G. R. F.

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**PERGAMINO**, a city of Argentina, situated about 180 mi. west of Buenos Aires, near the edge of the Pampa. It is connected with the capital by railway, as well as by a good highway, and is commercially important as a distribution point for large business houses in Buenos Aires. It also does a brisk trade in the agricultural products of the surrounding country, which are mainly wheat and other cereals. Est. pop. 1930, 47,000.

**PERGAMUM**, a city and country of Asia Minor. During the Persian Empire it was ruled by tributary Greeks, but after the conquests and death of Alexander it was assigned by one of his generals to a Syrian Greek, Philetaerus, who organized the district as a kingdom, 283 B.C. Under Eumenes II, 263 B.C., it became independent; it was a center of culture second to Alexandria in Egypt, wealthy, and possessed of a strong army that often held the balance of power between Macedonia, Egypt and Syria. When Rome appeared as greater than these, Pergamum was her first ally in the east, and the kingdom ultimately became Roman property, the province of Asia, by bequest of its last ruler, Attalus III, 133 B.C.

It is celebrated for two masterpieces of sculpture: the marble statue of the *Dying Gaul*, by an unknown artist, now in the capitol at Rome; and the *Great Altar of Zeus*, an imposing structure in the city's acropolis, discovered by German archaeologists in 1871, now restored in Berlin. In the latter, the chief feature is a magnificent frieze, representing a furious battle between gods and giants. Pergamum, once the capital city of Mysia, is the modern Bergama.

**PERIASTRON**, that point in the orbit of a double star where the two components are closest together.

**PERICARDIUM, DISEASES OF.** The pericardium is a closed sac, in which lie the heart and a small portion of the large blood vessels leading to and from the heart. The sac consists of two layers, the layer next to the heart called the visceral layer and the outer one, the parietal layer. The visceral layer is in intimate contact with the outer surface of the heart, to which it is adherent. The parietal layer is much firmer and in close approximation to both lungs, aorta and esophagus. It is attached to the diaphragm, the sternum or breastbone and the large blood vessels. This close proximity and actual contiguity of the pericardium with so many structures permits disease to invade it from many sources.

Between the two layers there is normally about one half ounce of fluid which acts as a lubricant to the smooth opposing surfaces of the visceral and parietal layers. The pericardium is also supportive to the heart.

The first site of inflammation depends upon the type of disease. If extension has occurred from the covering of the lungs, naturally the contiguous structures are first involved, namely, the outer or parietal layer.

When the pericardium is involved following RHEUMATIC FEVER, congestion appears first at the attachment of the sac to the great vessels. Then the inner (visceral) layer becomes congested in patches, the smooth surface losing its glistening appearance and becoming dull and roughened. This causes a secretion of more fluid into the pericardial sac, which is called pericardial effusion. The type of infection will determine whether this fluid remains a serum or be filled with fibrin, and pus.

Inflammation of the pericardium is usually secondary to disease elsewhere. It occurs most frequently in connection with rheumatic fever in children (*see CHILDREN, DISEASES OF*). It is commonly associated with tuberculosis in middle life and with GOUT and chronic NEPHRITIS later in life. In PNEUMONIA and SCARLET FEVER, pericarditis is not an uncommon complication. It occurs at all ages, cases having been reported in the fetus. The chief organisms met with in acute pericarditis are the pneumococcus, the pus producing cocci, and the tubercle bacillus.

The symptoms and physical signs are variable. When there is a marked pericardial effusion, pain may be present, either sharp and stabbing or as a sense of distress and discomfort in the region of the heart. Shortness of breath, difficulty in speech and swallowing, an irritative cough associated with a peculiarly dusky, anxious countenance are the common symptoms. Delirium may be present when there is high fever.

For this reason no other serious disease is so frequently overlooked as is pericarditis. The outlook, in the cases where the increased pericardial fluid contains only a little fibrin, is good; however, if the disease progresses to the stage where bacteria have



entered the pericardial effusion and pus is produced therein, the chances for recovery are slight.

N. F. F.

**PERICLES** (c. 490-429 B.C.), Athenian statesman, whose father Xanthippus won distinction by his naval victory over the Persians at Myclae in 479. Through his mother Agariste, the niece of Cleisthenes, who had remodeled the Athenian constitution, he was connected with the famous family of the Alcmaeonidae. His most influential teacher was the philosopher Anaxagoras. Entering public life in 470, Pericles by his masterful oratory and constructive statesmanship soon became the leader of the democratic party. Although it is perhaps not fair to attribute all the military and diplomatic activities of Athens between 470 and 429 to his influence, there is no doubt that he was largely responsible for them. In the conduct of Athens during this period several policies may clearly be discerned. One is that of continued opposition to Persia, both by direct attack and by the strengthening of the Delian League and its gradual but unmistakable conversion into an Athenian empire. In 459 two hundred Athenian ships were sent to support an Egyptian revolt from Persia, and smaller fleets harried the Persians on the Phoenician coast and about Cyprus. However, the disaster which in 453 overtook the fleet sent to Egypt, and Cimon's death at Cyprus in 449 persuaded Pericles to abandon active opposition to Persia and to assent to a mutual agreement of non-interference.

Meanwhile more and more of the states belonging to the Delian League were persuaded to pay tribute to the common treasury rather than furnish their quota of vessels of war. Thus the revenue of the treasury rose from 460 to 600 talents annually. When this treasury (c. 453) was transferred from Delos to Athens the supremacy of Athens was asserted unblushingly. Another proof of the political and material ambition of Athens in the age of Pericles was her interest in colonial expansion, evidenced by the groups of settlers sent to various places in Euboea, to many islands in the Aegean, to Thrace, to the shores of the Hellespont, to the Black Sea, and to southern Italy. By these settlements Athens extended her commercial relations and enriched her coffers. But Athens' concern in enterprises across the sea did not blind her to problems nearer home. Resenting the interference of Sparta in the affairs of central Greece, Athens now asserted her competence to administer this area. By a victory in 457 at Oenophyta Athens gained control of Locris, Phocis and all of Boeotia except Thebes. Soon she secured a foothold on the Corinthian Gulf at Naupactus (445) and Pericles himself defeated the Sicyonians (454).

Athens was now so far confident of her ascendancy that Pericles issued an invitation for a general pan-Hellenic congress in Athens to consider common interests. But Sparta refused to acknowledge the leadership of Athens implied in this invitation, and the scheme was abandoned. The high hopes of Athens for undisputed mastery in central Greece soon received

a stunning blow, for the Boeotians, defeating and in large part capturing an Athenian army at Coroneia (447), bargained for their independence, whereupon Locris, Phocis and Euboea revolted, the Athenian garrison at Megara was massacred, and a Spartan army invaded Attica. Pericles by bribing the Spartan leaders secured the withdrawal of this army, and regained control of Euboea; but Locris, Phocis and Boeotia were permanently lost. Arranging a truce in 445, which was to last for 30 years, Athens abandoned her project of extending her dominion in Greece proper. Pericles now concentrated his attention upon further securing the naval supremacy of Athens. His determination to preserve the integrity of the Athenian empire in the Aegean he proved in person by reducing Samos, which had revolted, to submission.

Director of the foreign and imperial policy of Athens, Pericles won the support of the citizenry by a number of democratic measures. At his proposal Athenian soldiers, hitherto unpaid, received a slight remuneration for service; a stipend was provided for jurymen, and probably for magistrates and members of the *boule*, or senate; and a fund was created out of which the poor might be compensated for the loss of time and pay involved in attendance upon the annual dramatic festivals. Moreover to Pericles we may perhaps ascribe the opening of the magistracies to the lower classes of the citizens. Under his direction Pheidias, a sculptor of genius, assisted by the architects Ictinus and Callicrates, erected many buildings contributing to the beauty and glory of Athens, their crowning achievements being the Propylaea, or great gate of the Acropolis, and the Parthenon, ever since regarded as the fairest and most perfect building in Greece. The expenditure of the common funds of the Athenian confederacy for the beautification of Athens Pericles justified by the passionate love of their city which the contemplation of such buildings would inevitably engender in the breasts of the Athenians.

As an accompaniment to the physical adornment of Athens there was an extraordinary efflorescence of great literature, Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides and many others making the age of Pericles unique in literary annals. In 431 Sparta, alarmed by the growing power of Athens, declared war. Although the specific pretexts upon which Sparta did so are not pertinent, it is noteworthy that Pericles' general attitude to Sparta was far from conciliatory. Pericles' military policy was conservative. In the first year of the war and again in the second, drawing all the citizens within the walls of Athens, he permitted the Spartans to ravage Attica without molestation. At the same time his fleet harried the Peloponnesian coast and secured a full supply of provisions for Athens. Doubtless he hoped that the futility of their invasions would induce the Spartans to abandon the war. But in the summer of 430 a destructive plague turned the Athenians to thoughts of peace, and Pericles with difficulty persuaded them to continue the struggle. In the autumn

# PERGAMUM

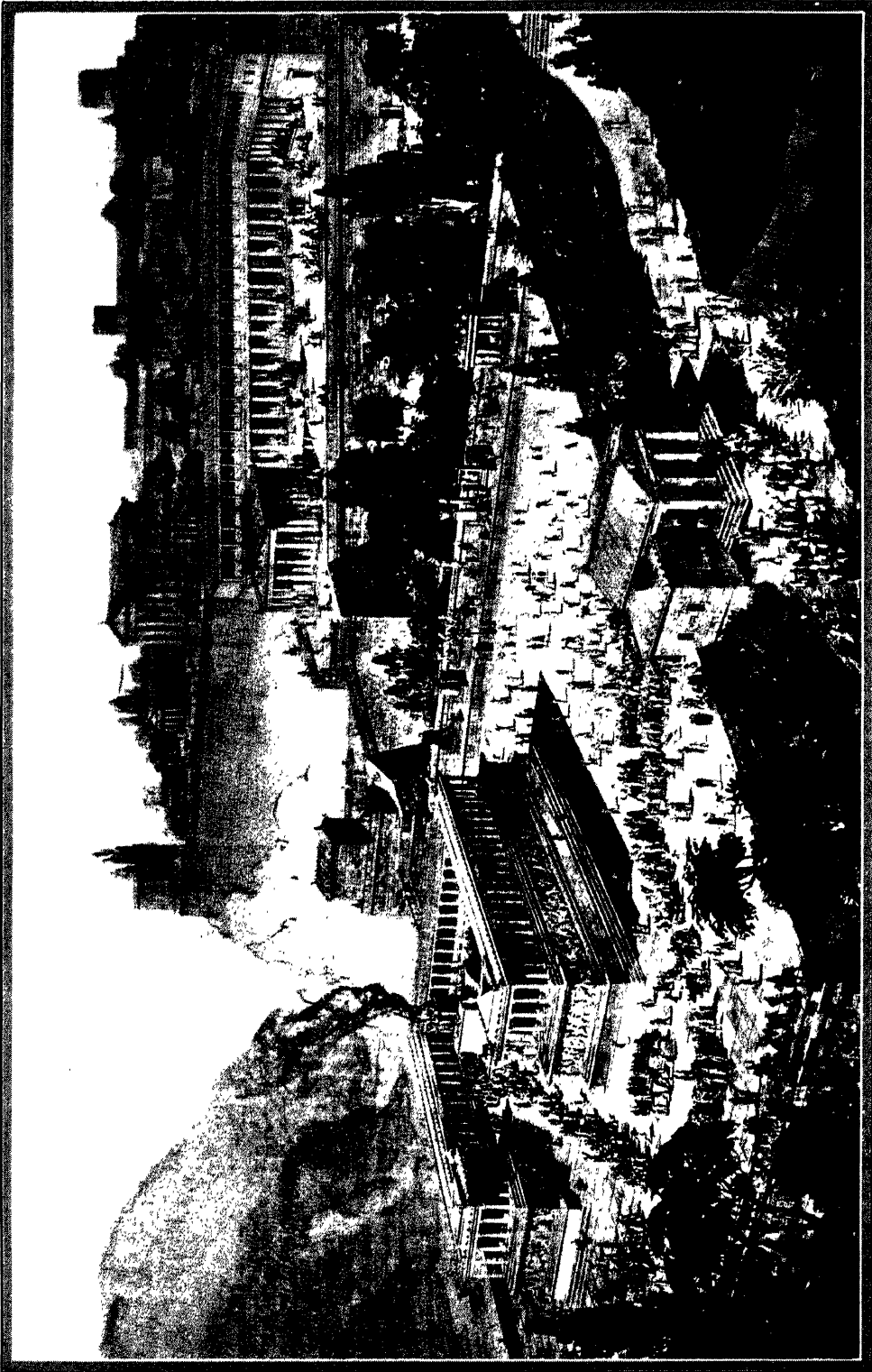


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## THE GREAT ALTAR OF ZEUS AT PERGAMUM

1. Section showing Hecate, Artemis, Leto and Apollo in the sculptured relief frieze of the battle of the gods and giants.
2. Detail of the frieze with Phoebe and Asteria.
3. Altar as erected in the Pergamum Museum, Berlin. Pergamum is the present Bergama in Asia Minor.

## PERGAMUM



### THE ACROPOLIS AT PERGAMUM

The acropolis was the center of life in the great ancient city of Asia Minor. The chief public buildings are shown, including the Altar of Zeus, and in the background the six-columned temple of Athena and the palace. (From an original drawing in the Pergamum Museum, Berlin.)

of 429, after a lingering illness, Pericles died. Soon the Athenians abandoned their conservative conduct of the war, and entrusting their fate to guardians less worthy than Pericles, were finally (404) overwhelmingly defeated by Sparta. G. M. H.

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**PERIDOT**, another name for OLIVINE usually applied to the gem varieties of that mineral. It is called CHRYSLITE when greenish-yellow and peridot or "evening emerald," when olive green.

Peridot is transparent to translucent, occurring in various shades of green, yellow, brown, reddish and grayish. The most desirable color is a bottle green, which is rare. It is found in orthorhombic crystals, in rounded grains, granular masses and water-worn pebbles. Chemically peridot is an iron-magnesium silicate. It commonly occurs in basic IGNEOUS ROCKS and LIMESTONES. A rock composed mostly of olivine is called peridotite. The principal sources of the gem material are Burma, Ceylon, Australia, Brazil. It is also found in Arizona and New Mexico, and on an island in the Red Sea called Zeboiget.

**PERIDOTITE**, an igneous rock composed largely of OLIVINE with some PYROXENE. The name is from the French for olivine, PERIDOT. In color the peridotites vary from green to black, and are usually of a coarsely granular texture. They are commonly associated with large intrusions of GABBRO, but are also found as isolated dikes and sills.

Peridotites frequently contain minerals valuable as ores; for example, CHROMITE, the ORE of chromium; PLATINUM, both native and as the arsenide, sperrylite; the precious GARNET, pyrope; GARNIERITE, a nickel silicate weathered out of serpentinized peridotite; most important, from the "BLUE GROUND" of South Africa, an altered peridotite, comes most of the world's DIAMOND supply. Peridotites are of widespread occurrence. See also CHRYSLITE; PETROLOGY.

**PERIGEE**, that point in the moon's orbit where it is nearest the earth.

**PÉRIGUEUX**, an ancient town in south central France, capital of the department of the Dordogne. The Romans made it a favorite colony, and the Tour de Vesone and an almost ruined amphitheater recall their occupation. Early feudal Périgord, capital of Périgord, was in two distinct parts. In the old *cité* the Church of St. Étienne, 11th and 12th centuries, remains as the chief building; on the Puy St. Front the 12th century cathedral was erected next to a 6th century basilica of which a part still stands. Périgueux has charming modern parks and boulevards; but the old town remains medieval and picturesque. Périgueux is the center for visits to the prehistoric caves of the Dordogne, and has an interesting archaeological museum. Commercially, its fame rests chiefly upon its truffles and *patés de foie gras*. Pop. 1931, 33,988.

The Cathedral of St. Front, built in the form of a

Greek cross, and crowned by great domes and a tall tower, is one of the most curious churches in France. It resembles St. Mark's in Venice, and is thought by some to be a copy of that church. Its exact date is unknown, but it is probably, in the main, of the 12th century. The cathedral was restored by Abadie, and



12TH CENTURY ROMANESQUE NAVE (RESTORED) OF SAINT FRONT CATHEDRAL, PÉRIGUEUX

with its rebuilt cupolas and gleaming white walls offers little appearance of antiquity. To one side of the cathedral stands the exceedingly interesting façade of St. Front *primitif*, which goes back to the 6th century.

**PERIHELIO METER.** See ACTINOMETER.

**PERIHELION**, that point in the orbit of a planet or comet which is nearest the sun.

**PERIODICAL**, a magazine, Review, or other publication issued at regular or stated intervals. The 17th century produced the first authentic periodicals, the French *Journal des Savants*, 1665, and the English *Acta Philosophica*, 1665, both devoted to reviewing new books. The 18th century in England was remarkable for Addison and Steele's *SPECTATOR* and Tatler, producing also *The Examiner*, 1710, *The Guardian*, 1712, and *The Gentleman's Magazine*, 1731. Noteworthy early American periodicals were Benjamin Franklin's *General Magazine*, 1741, *Pennsylvania Magazine*, 1775, *American Museum*, 1787, *Monthly Anthology*, 1803, *Literary Magazine*, 1803, SALMAGUNDI, 1807, *Port Folio*, 1809, *Godey's Lady's Book*, 1830, *The Dial*, 1840, and *Graham's*, 1841; and, still surviving, *Harper's*, 1850, *Atlantic Monthly*, 1857, *Scribner's*, 1870, *Forum*, 1885, and *The Bookman*, 1895. Illustrations for periodicals came into use largely in the 19th century, when also children's periodicals—as *The Young Misses' Magazine*, 1806, *Youth's Companion*, 1827, and *St. Nicholas*, 1873—were originated in the United States.

**PERIODIC CURRENT**, an electric current whose strength or direction varies periodically, e.g., an ALTERNATING CURRENT. Such a current flows in one direction in the CIRCUIT, gradually rising in value

from zero to a maximum and then falling off to zero; it reverses, gradually reaches a negative maximum and once more falling off to zero. The time required for the complete cycle is called the period. The periods of such a current are equal.

But a periodic current is not necessarily alternating. By suitable means an alternating current may be rectified, i.e., the negative flow may be reversed or eliminated so that the rising and falling current flows always in the same direction. A rectified alternating current is a *pulsating current*, and is periodic, but not alternating. Rectified alternating currents are used for many purposes in which unidirectional currents are required, such as charging storage BATTERIES, energizing ELECTROMAGNETS and operating electronic tubes (see TUBES, ELECTRONIC).

In this connection it is notable that the electromotive forces generated in all dynamos, with unimportant exceptions, are periodic and alternating. A direct-current dynamo is in reality an alternator equipped with an automatic switching or rectifying device, called a COMMUTATOR. See also RECTIFIER.

L. B. S.

**PERIODIC SYSTEM OF CHEMICAL ELEMENTS**, the name given to the classification of chemical elements in a table such that the periodicity in their chemical properties is brought out by their position in this table. It had been known since the early part of the nineteenth century that certain curious relations existed between the atomic weights of elements with similar chemical properties, and while a number of chemists investigated and contributed to this question, the credit for the establishing of the Periodic Law in its most definite form is generally given to Mendeleeff, who not only realized that it was the VALENCE which constituted the principal periodic property of an element, but who furthermore was able, from the arrangement of his periodic table, to predict successfully the chemical properties of elements which had not then been discovered. Subsequent developments in our knowledge concerning the structure of the atom has shown that it is not so much the ATOMIC WEIGHT on which depends the position of an element in the periodic table, and thus also its chemical properties, but rather its ATOMIC NUMBER, denoting the total positive electric charge on the central nucleus of the atom, and likewise indicating the number of electrons revolving about this nucleus.

Assuming the modern ideas on the structure of the atom to hold, Hydrogen, which has one electron circling around a single proton, has the atomic number 1. Helium, with two moving electrons, is assigned atomic number 2. Then follow eight elements all containing the same two moving electrons as those in the helium atom, but which, in addition, possess from one to eight more electrons, revolving *outside* these first two, Lithium having 1, Beryllium 2, Boron 3, Carbon 4, Nitrogen 5, Oxygen 6, Fluorine 7, and Neon 8. Apparently this is the maximum number this "shell" of electrons can hold and, when a ninth is added, it is forced to move in a path lying outside

that of the previous eight. Thus, the next element, Sodium, having atomic number 11, possesses its innermost two electrons as in Helium, the completed shell of 8 electrons as in Neon, and one more outside. Since the number of electrons in the outermost orbits appears to determine the chemical character of an element, Sodium, with  $2 + 8 + 1 = 11$  electrons, is similar to Lithium, with  $2 + 1 = 3$ , while Neon, whose shell of 8 electrons is complete, resembles Helium in its absence of chemical affinity—it is one of the inert gases. Continued addition of electrons results in the formation of the elements Magnesium, Aluminum, Silicon, Phosphorus, Sulphur, Chlorine and Argon, each of which resembles closely the corresponding element in the first series of eight. After this third shell of electrons is completed, a fourth one is begun which, however, requires 18 electrons before it is completed, and thus results in two series of elements whose properties correspond to those of the earlier series, except that there can be only one inert gas, with a completed shell, viz., Krypton, which resembles Helium, Neon, and Argon, and three additional elements, Iron, Nickel, and Cobalt, which are in a class by themselves. The next, and fifth, series again contains 18 elements, but the sixth has no less than 32, and thus, in addition to the 18 elements similar to those of the fifth series, it contains 14 more, all of which are known collectively as the RARE EARTHS. The structure of the atoms now becomes so complicated that apparently these atoms become unstable and RADIO-ACTIVITY makes its entry in the properties of these elements. This holds to even greater extent for the next, and seventh, of which only six elements are known, and which extends as far as Uranium, with atomic number 92, the highest at present known. Only one element, of atomic number 85, has not yet been identified; apart from this the periodic table has been "filled" completely, and thus there can be no more room for further "new" elements.

Element number 87 was discovered in 1931 by Dr. Jacob Papish at Cornell University. It is a highly inflammable, insoluble solid, unusually sensitive to light. A few milligrams of it were obtained as a sulphate compound from the mineral known as samarskite.

Although the atomic weight, which indicates the total number of pairs of protons and electrons in the atom, does keep step, generally speaking, with the atomic number, this is not necessarily so, and it follows, from the modern conceptions of the atom, that it is possible for two different elements to have the same atomic weight, and for two substances of different atomic weight to have the same atomic number—in the latter case these substances are known as isotopes. Thus two atoms might both have the atomic weight 18, but the one might contain 18 protons and 10 electrons in the nucleus with 8 revolving electrons, while the other might have 18 protons and 9 electrons in the nucleus and 9 electrons revolving: the former would have atomic number 8 and be chemically iden-

PERIODIC TABLE OF CHEMICAL ELEMENTS

GROUP O	I	II	III	IV	V	VI	VII	VIII		
	Hydrogen H 1 1.008									
Helium He 2 4.00	Lithium Li 3 6.94	Beryllium Be 4 9.08	Boron B 5 11.00	Carbon C 6 12.00	Nitrogen N 7 14.01	Oxygen O 8 16.00	Fluorine F 9 19.0			
Neon Ne 10 20.2	Sodium Na 11 23.00	Magnesium Mg 12 24.32	Aluminum Al 13 27.1	Silicon Si 14 28.3	Phosphorus P 15 31.04	Sulphur S 16 32.07	Chlorine Cl 17 35.46			
Argon Ar 18 39.88	Potassium K 19 39.10	Calcium Ca 20 40.07	Scandium Sc 21 44.1	Titanium Ti 22 48.1	Vanadium V 23 51.0	Chromium Cr 24 52.0	Manganese Mn 25 54.93	Iron Fe 26 55.84	Cobalt Co 27 58.97	Nickel Ni 28 58.68
	Copper Cu 29 63.6	Zinc Zn 30 65.37	Gallium Ga 31 69.0	Germanium Ge 32 72.5	Arsenic As 33 74.96	Selenium Se 34 79.2	Bromine Br 35 79.92			
Krypton Kr 36 82.9	Rubidium Rb 37 85.45	Strontium Sr 38 87.63	Yttrium Y 39 89.0	Zirconium Zr 40 90.6	Colombium Cb 41 93.5	Molybdenum Mo 42 96.0	Masurium Ma 43 98.0	Ruthenium Ru 44 101.7	Rhodium Rh 45 102.9	Palladium Pd 46 106.7
	Silver Ag 47 107.88	Cadmium Cd 48 112.40	Indium In 49 114.8	Tin Sn 50 119.0	Antimony Sb 51 120.2	Tellurium Te 52 127.5	Iodine I 53 126.92			
Xenon Xe 54 130.2	Caesium Cs 55 132.81	Barium Ba 56 137.57	Rare Earths	Hafnium Hf 72 178.8	Tantalum Ta 73 181.5	Tungsten W 74 184.0	Rhenium Re 75 187.0	Osmium Os 76 190.9	Iridium Ir 77 193.1	Platinum Pt 78 195.2
	Gold Au 79 197.2	Mercury Hg 80 200.6	Thallium Tl 81 204.0	Lead Pb 82 207.15	Bismuth Bi 83 208.0	Polonium Po 84 210.2	..... 85			
Radon Rn 86 222.2	(Un- named) 87 (Discovered Oct., 1931)	Radium Ra 88 226.2	Actinium Ac 89 227.2	Thorium Th 90 232.2	Uranium X <sub>2</sub> Ux <sub>2</sub> 91 234.2	Uranium U 92 238.2				

tical with Oxygen, the latter would have atomic number 9 and be identical with Fluorine. On the other hand, the elements Ionium, with 230 protons and 140 electrons in the nucleus, and 90 revolving electrons, and Thorium with 232 protons and 142 electrons in the nucleus and 90 revolving electrons, both have the atomic number 90, and are thus chemically identical, though of a different atomic weight: they are isotopes.

W. J. L.

**PERIPATETICS**, followers of Aristotle and so called because of the walk at the Lyceum where Aristotle taught. It was his custom to walk while conducting his discussions.

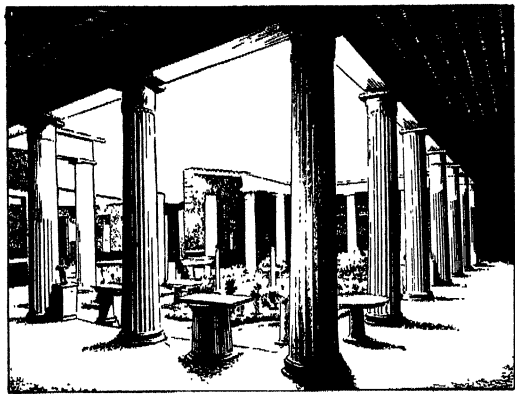
**PERISCOPE**, an optical instrument, generally used for military purposes, by which an observer may make observations while remaining protected. In its sim-

plest form it comprises two MIRRORS or reflecting PRISMS mounted in opposite ends of a tube. The first mirror or prism changes the direction of the light from the object being viewed so that it travels along the tube to the second mirror or prism, which directs it through the eyepiece of the instrument. The periscope is often provided with a rotatable upper head which enables observations to be made in any direction. The submarine periscope may be extended or retracted at will, enabling surface boats to be seen while the submarine remains submerged. Trench periscopes are relatively short periscopes which make it possible to see over earthworks. Large periscopes which enable the observer on the ground to view objects as though from an elevation of 40 or 50 ft. have been occasionally employed in land military opera-

tions. Periscopes are of relatively low magnification in order that a large field of view may be obtained.

I. C. G.

**PERISTYLE**, a continuous colonnade completely surrounding a building, as in the typical Greek temple, or surrounding a court. From their colonnades the



PERISTYLE OF THE CASA DEI VETTI, POMPEII, ITALY

rear courts of the usual Roman house are often called peristyles.

**PERITONEUM**, the thin membrane lining the abdominal cavity. It is formed by the flattening of the cells lining the **CELOM** or primitive body cavity. The peritoneum lines the inner surface of the wall of the abdomen, is continued along the sides and back of the abdomen to the **MESENTERY** from which the intestine is suspended and attached to the posterior abdominal wall, and over the surface of the intestine. In this way a completely closed potential cavity is formed, the abdominal or peritoneal cavity. The peritoneum is highly sensitive to infection which is apt to terminate fatally. (See **PERITONITIS**.) For diagram, see **ABDOMEN**.

**PERITONITIS**, inflammation of the peritoneum. The more common causes of peritonitis are inflammation of the contained viscera, particularly the appendix or female generative organs; bursting of a hollow organ, such as the stomach or duodenum, and injuries to the abdomen, such as penetrating wounds from a stab or a bullet. Tuberculosis also occasionally involves the peritoneum, causing a form of peritonitis which may persist for several months or longer.

Inflammation of the peritoneum may result in the formation of pus and other forms of exudate, which may spread diffusely or become enclosed in delicate adhesions, forming the type called localized peritonitis. The latter form is less serious than when the process spreads widely without limitation. Adhesions which involve important structures may cause trouble in the future if the patient survives the early stage.

The chief symptoms are severe pain in the abdomen, fever, vomiting and great anxiety. The abdomen becomes rigid and tender to pressure. Death frequently

results in the more extensive forms, unless immediate operation is performed early. Operation offers the chief hope of recovery in this serious illness.

W. A. B.

**PERIWINKLE** (*Vinca minor*), in botany, a trailing evergreen perennial of the dogbane family, often called running-myrtle. It is a native of Europe, widely cultivated in numerous varieties, and extensively naturalized in eastern North America. The slender stems bear oblong leaves and attractive lilac-blue flowers produced singly on erect stalks from the leaf axils. The great periwinkle (*V. major*), native to Europe, with blue flowers 2 in. across, and the Madagascar periwinkle (*V. rosea*), with rosy-purple flowers, are often grown in gardens.

**PERIWINKLE**, strictly the popular name for members of a genus (*Littorina*) of small sea snails or shell-bearing marine gastropods, numerous on rocky shores both in North America and Europe. There are two common American species (*Littorina rudis* and *Littorina palliata*). Another species (*Littorina littorea*) was introduced from Europe in 1857, and is now found from Labrador to New York in greater numbers than either of the native species. Other periwinkles live in Jamaica and Panama.

The periwinkles have top-shaped spiral shells, which may vary greatly in color. In one species (*Littorina palliata*) the color may be green, yellow or red and the shells often blend with the seaweeds where they are found. In Europe periwinkles have been eaten since Paleolithic days. Thousands of tons of them pass through the London market annually. Almost any small snail may be popularly known as a periwinkle, and about Long Island the oystermen call the big conchs which feed on the oyster beds winkles.

**PERJURY**. A wilful assertion known to be false and intended to mislead a court, jury, or tribunal, made on oath or in any manner legally substituted for an oath, as a part of the evidence of a witness. It must be made upon some point material to the issue to be decided. Statutes have extended the crime to cover all with false swearing. Inducing another to commit perjury is the crime of subornation of perjury.

**PERKIN, SIR WILLIAM HENRY** (1838-1907), English chemist, was born at London, Mar. 12, 1838. He attended the Royal College of Chemistry, London, and devoted himself to preparations of coloring materials. In 1856, somewhat by accident, he discovered the first aniline dye, a mauve. He began manufacturing and continued until 1874 when he retired to do chemical research. He made a number of discoveries in the chemistry of foodstuffs and conducted minute and fruitful investigations of isomerism. He was knighted in 1906 and died at Harrow, July 14, 1907.

**PERLIS**, a state of the **MALAY PENINSULA** lying on the west coast and comprising an area of about 300 sq. mi., being the smallest of the Malay States. Perlis is the chief river and Perlis, situated about 10 mi. from the mouth of this river, the chief town. Rice, tin and coconuts are the principal products and to-

gether with hides, copra, rubber and cattle, constitute the exports. Perlis is a British possession. In 1921 the population, chiefly Malays, Chinese and Indians, was 40,091.

**PERLITE**, a peculiar variety of glassy, extrusive FELSITE lava, composed mostly of small, round grains, about the size of a pea, with an onion-like, concentric structure, produced by peculiar cracking during cooling. The appearance is pearly or enamel-like, whence the names perlite and pearlstone. This structure is produced only in acid magmas, never in BASALTS. Perlites are of no commercial importance. They are found in Hungary and elsewhere. *See also* OBSIDIAN; LAVA; PITCHSTONE.

**PERM**, a large commercial city in the Ural Region of the R.S.F.S.R., in east central European Russia, on the Trans-Siberian railroad. It is on the banks of the Kama River, and is a shipping point for goods to and from Siberia and the Kama districts. Leading manufactures are cream separators, matches, leather goods, phosphate products and cardboard. Originally the home of the Permyaks, a Finnish tribe, Russian merchants set up a community here in 1568. With the discovery of copper ore nearby in the 18th century, Perm increased in population, and in 1824 the Russian government established a state copper-smelting plant here. The city became the capital of the now non-existent Perm province in 1781, and under czarist rule was the home of exiled political offenders. The city's outstanding educational activities center around a scientific museum, the State university, and a polytechnic institute. Pop. 1926, 119,776.

**PERMALLOY**. *See* NICKEL STEEL.

**PERMANENT COURT OF INTERNATIONAL JUSTICE**. Like the League of Nations, the Permanent Court of International Justice is an outgrowth of the peace treaties of 1919-1920. This court rests upon a statute which was approved by the League in the fall of 1920. Its seat is The Hague. The court has 15 judges elected for a period of nine years by the Assembly and Council of the League. A state coming before the Court may name an *ad hoc* judge in case a judge of its nationality is not already represented. The court's expenses are borne by the League of Nations, and amount to about half a million dollars a year. Only states may bring cases before the court. In adhering to this court a state does not, however, confer compulsory jurisdiction upon it unless it accepts the so-called Optional Clause. When a state accepts this clause it undertakes to refer *ipso facto* all legal disputes concerning the interpretation of a treaty; any question of international law; the existence of any fact which, if established, would constitute a breach of an international obligation; the nature or extent of the reparation to be made for the breach of an international obligation. About 36 states are now bound by this clause; Japan is the only permanent member of the League Council which has not accepted the compulsory jurisdiction of the court.

In exercising its jurisdiction the court applies international conventions and custom, the general prin-

ciples of law recognized by civilized nations; judicial decisions and the teachings of the most highly qualified publicists. It may also settle cases upon the basis of equity (*ex aequo et bono*).

In addition to hearing a regular case, the court may also give an advisory opinion upon any dispute or question referred to it by the League Council or Assembly. The court is not bound to give such an opinion, and did not do so in the Eastern Carelia case. The procedure governing advisory opinions is identical with that of cases. Up to 1931 the Court had decided about 40 cases and advisory opinions. The opinion which perhaps attracted the widest attention was that handed down in Aug., 1931, declaring invalid the proposed Austro-German customs union.

On Jan. 27, 1926, the United States Senate voted to enter the Permanent Court, subject to a number of reservations. These provided that such adherence would not involve any legal relationship with the League on the part of the United States. Moreover, the United States should be permitted to participate in the election of judges by the Council and Assembly, should pay a fair share of the expenses of the Court, and should be allowed to withdraw at any time. The statute of the court should not be amended without the consent of the United States. The most important reservation was that the court should not entertain without American consent any request for an advisory opinion "touching any dispute or question in which the United States has or claims an interest." At a conference held in Sept., 1926 the other states accepted all of these reservations except the last. They objected to this on the ground that it might give the United States a veto power which other states did not possess. For two and a half years no further steps toward the entry of the United States into the court were taken. In Mar., 1929, however, Elihu Root proposed a formula before a committee of jurists at Geneva to the effect that whenever a proposal for an advisory opinion came before the League Council or Assembly, an exchange of views with the United States should take place. If negotiation could not remove its objection the United States would have the right to withdraw from the court "without any imputation of unfriendliness. . ." President Hoover accepted the Root Formula, and on Dec. 10, 1930 submitted the necessary documents to the United States Senate for its approval.

R. L. BU.

**PERMEABILITY, MAGNETIC**. *See* MAGNETIC INDUCTION.

**PERMEAMETER**, an instrument for measuring the relations between the magnetizing force and the MAGNETIC INDUCTION produced. Among the outstanding instruments are the Burrow's permeameter and the Fahy's simplex permeameter.

Magnetic induction is best measured when there are no demagnetizing effects due to free magnetic poles. Such conditions are secured by using the material in the form of a ring. This is inconvenient because it necessitates winding primary and secondary



coils on each specimen studied. In both of the instruments just mentioned, the closed magnetic circuit is obtained by the use of a heavy yoke across which the specimen to be measured is laid. For routine work this is a great convenience.

**PERMIAN PERIOD**, formerly the third subdivision of the CARBONIFEROUS PERIOD, now considered to rank as the seventh and closing period of the PALEOZOIC ERA of geological history.

**PERMISSIBLE EXPLOSIVE**, a short-flame explosive, safe for firing, under favoring conditions, in the gases found in many coal mines. The U.S. Bureau of Mines cannot compel the use of these explosives, so they are termed "permissible."

**PERMUTATIONS**, in algebra, the number of ways in which the order of a certain number of objects can be arranged. For example,  $a$  and  $b$  can be arranged as  $ab$  or  $ba$ . The number of permutations of three things taken all together is  $3 \cdot 2 \cdot 1$ , or 6, namely,  $abc, acb, bac, bca, cab, cba$ ; and taken two at a time it is  $ab, ac, ba, bc, ca, cb$ , which is also  $3 \cdot 2$ , or 6. The number of permutations of  $n$  things taken all at a time is  $n!$ , that is, factorial  $n$ , or

$$n(n-1)(n-2) \dots 1.$$

Taken  $r$  at a time it is

$$n(n-1)(n-2) \dots (n-r+1).$$

The number of permutations, or arrangements, of  $n$  things of which  $p$  are alike, and  $q$  others are alike, and  $r$  others are alike, . . . is

$$\frac{n!}{p!q!r! \dots}$$

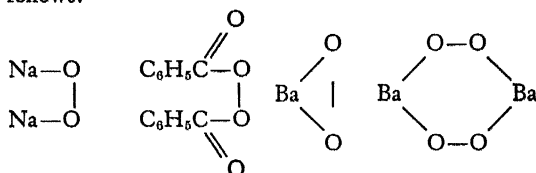
See COMBINATORIAL ANALYSIS.

**PERNAMBUCO.** See RECIFE.

**PERNAU.** See PÄRNU.

**PERNICIOUS ANEMIA.** See ANEMIA.

**PEROXIDES**, chemical compounds which may be theoretically regarded as derivatives of HYDROGEN PEROXIDE,  $H_2O_2$ . True peroxides are characterized by such examples as sodium peroxide,  $Na_2O_2$ ; benzoyl peroxide,  $(C_6H_5CO)_2O_2$ ; barium peroxide,  $BaO_2$  or  $Ba_2O_4$ . The structural formulae may be written as follows:



The term peroxide is also loosely applied to polyoxides which have not the true peroxide structure, as to lead dioxide,  $PbO_2$ , and manganese dioxide,  $MnO_2$ , which have structures:



True peroxides yield hydrogen peroxide in dilute acid solution and some of them liberate OZONE from concentrated acid solution. O.R.

**PERPENDICULAR STYLE**, the last of the styles of English Gothic, roughly from 1360 on to the time of the Renaissance. It is so called from its use of window tracery in which vertical bars carry through almost unbroken from sill to arch, braced laterally by continuous horizontal bars supported on little arches, so that the whole window is divided into tiers of arched lights of similar sizes over each other. The style is also characterized by a search for height and verticality, and the elimination of wall surface; by the elaborate development of decorative vaulting culminating in the FAN VAULT; and by decorative lavishness attained by the great use of wall tracery rather than by carved ornament. A common motive is the Tudor, or four-centered arch, which when used for door or fireplace openings, is often surrounded by a rectangular molded frame.

In secular work there was during this period a great development of the complexity and comfort of house plans, and also of their exterior expression by means of banks of windows, many bay windows and gables, complex chimney designs with the separate flues carried up in separate polygonal or twisted stacks, and a great increase in the use of HALF-TIMBER construction. House interiors were studied with growing care, and the free and lavish use of wood paneled interiors gives frequent charm. See GOTHIC ARCHITECTURE for examples and bibliography.

**PERPETUAL MOTION.** The law of conservation of ENERGY states that energy can neither be created nor destroyed. This means that every machine thus far devised is simply a means for transforming energy from one form into another. The STEAM ENGINE takes the energy of HEAT and transforms it into mechanical energy. A perpetual motion machine attempts to create energy without any source of energy. It is attempting to lift oneself by his boot straps.

In the case of a steam engine, fuel must be burned under the boiler to furnish the energy to turn the wheels. The electric motor (see MOTOR, ELECTRIC) requires electricity to be supplied to it before it will produce mechanical action. The inventor of a perpetual motion machine, however, hopes to be able to make the wheels go around without the expenditure of energy from some external source. He seeks to create an engine without fuel, a motor without electricity. Every year has seen dozens of applications filed for patent rights on some mechanical device for which perpetual motion was claimed. The fact that not a single one has ever proved itself practical is as good an indication as any that the idea of perpetual motion is absurd.

The difficulty in making a perpetual motion machine is the presence of FRICTION in its moving parts. Thus far, man has not been able to devise a machine free from friction. It requires energy to overcome friction, and if there is no supply of energy present,

the machine will not run. It is true that the planets move about the sun in perpetual motion. Newton stated that a body would continue in its state of rest or of uniform motion in a straight line, unless acted upon by some outside force. This is called the *inertia of matter*. Where no friction occurs, a body will continue to move once it is set in motion, but so long as friction appears, just so long will perpetual motion be an impractical idea, so far as man-made machines are concerned.

S. R. W.

**PERPIGNAN**, an old town and former stronghold once the capital of Roussillon and in 1659 annexed to France, now the capital of the department of the Pyrénées-Orientales. It is situated in the south of France about 6 mi. from the Mediterranean and close to the Spanish border. Most of its ancient ramparts have been demolished, but it still retains its old citadel. Perpignan is the center for trade in Roussillon wines. Pop. 1931, 73,962.

**PERRAULT, CHARLES** (1628-1703), French writer, was born in Paris, Jan. 12, 1628. He was educated for the law, practiced for a time in Paris, and was in government service until 1683. In 1671 he was elected to the Académie Française. Devoting himself to literature in later life, he first produced critical and controversial work, then turned to the composition of tales in verse, the first of which, *Grisélidis*, appeared in 1691. After this he made his lasting place in the world's literature with his prose *Tales of Mother Goose*, 1697. Drawing much of his material from folklore, he put into literary form, and immortalized, the stories of Red Riding Hood, CINDERELLA, Puss in Boots, the Sleeping Beauty, BLUEBEARD and others. Perrault died in Paris, May 16, 1703.

**PERRY, BLISS** (1860- ), American author, university professor and man of letters, was born at Williamstown, Mass., Nov. 25, 1860. After graduation from Williams College he studied at the universities of Berlin and Strasburg. On his return he was professor of English at Williams, 1886-93, of oratory and criticism at Princeton, 1893-1900, and from 1907 to 1930 held a chair of English literature at Harvard. For ten years after 1899 he was editor of the *Atlantic Monthly*. He was general editor of the Cambridge edition of poets and has edited many other books. Perry's many published works include fiction, essays, criticism and biography, but he is best known by the last three, among which are *The American Spirit in Literature*, *A Study of Poetry*, *Park Street Papers*, *Walt Whitman*, *Carlyle* and *Whittier*.

**PERRY, MATTHEW CALBRAITH** (1794-1858), American naval officer, was born in South Kingston, R.I., April 10, 1794. He was commissioned a midshipman in the Navy Jan. 16, 1809 when only 14 years old. He served in the War of 1812 and was promoted to a lieutenant, 1813, a commander 1826, and a captain 1837. During the MEXICAN WAR (1846-47) in command of a fleet of vessels he engaged in naval attacks upon several Mexican towns, including Vera Cruz. President M. FILLMORE sent Perry to

Japan in 1853 for the purpose of opening up trade relations between the United States and Japan which had been virtually closed to the trade and even to the entry of individuals of all nations. Perry with dignity and tact, succeeded in presenting his credentials and President Fillmore's letters to important officials of Japan. He returned early the following year, and in Mar. 31, 1854 concluded a treaty between the two countries to the effect that two Japanese ports would be open to American vessels for needed supplies and for trading under Japanese regulations and also that shipwrecked American vessels with their crews should be aided by the Japanese. The treaty which was ratified and proclaimed in 1855 included the "most favored nation" clause whereby the United States automatically enjoyed all privileges granted by Japan to other nations. The rights conceded to the United States were slight but they formed a wedge which gradually opened Japan to the trade and intercourse of the world, a development which is at least partially due to Perry's skilful negotiations. He died in New York City, Mar. 4, 1858.

**PERRY, OLIVER HAZARD** (1785-1819), American naval officer, was born in South Kingston, R.I., Aug. 23, 1785, and at 14 entered the Navy. In the War of 1812 he constructed a fleet of nine vessels on Lake Erie, where he captured the British squadron in Sept. 1813. On this occasion of an extremely important victory for the American forces, he wrote the famous message, "We have met the enemy and they are ours." After being commissioned a captain he commanded the *Java* in the Mediterranean in 1815-16, and in 1819 went to the West Indies to protect American commerce from pirates. He died in Port of Spain, Trinidad, Aug. 23, 1819.

**PERRY, RALPH BARTON** (1876- ), American philosopher, was born at Poultney, Vt., July 3, 1876. He was educated at Princeton and Harvard, and served as instructor of philosophy at Harvard from 1902 to 1913, when he became professor. In 1921-22 he was Hyde lecturer in French universities. He edited William James's *Essays in Radical Empiricism* and published several original works including *The Approach to Philosophy*, 1905, and *General Theory of Value*, 1926.

**PERRY**, a city in Dallas Co., southwestern central Iowa, situated on the Raccoon River, about 40 mi. northwest of Des Moines. Three railroads afford transportation. Perry is situated in a rich agricultural region, where farming, dairying and stock-raising are carried on extensively. The local industries include the manufacture of condensed milk, canned goods and machine and railroad shop products. There are also nurseries and meat-packing houses. King State Park, in Guthrie Co., is near Perry. Pop. 1920, 5,642; 1930, 5,881.

**PERSEIDS**, the shower of METEORS visible in July and August, and appearing to radiate from the constellation PERSEUS.

**PERSEPHONE, PROSERPINE** or **KORE**, in Greek mythology, the daughter of ZEUS and DEMETER,

who was carried off by **PLUTO**, to be the Queen of Hades. Demeter in anger refused to let the earth yield any harvest so long as her daughter was held in the infernal regions. Zeus, as arbiter, arranged with Pluto to allow Persephone to visit her mother half the



PERSEPHONE AND PLUTO, AS PICTURED  
ON AN ANCIENT FUNERARY URN

year, or, according to some myths, for two-thirds of the year. As Queen of Hades Persephone controlled the dead, whom Hermes led to the lower world at her bidding. She is sometimes represented as holding a sheaf of wheat to show her connection with Demeter, goddess of agriculture.

**PERSEPOLIS**, the ancient capital of the Persian Empire, probably dating from the time of Darius I. The city was built on the northern side of the Araxes River. Persepolis was too inaccessible to be a popular residence for the kings, but was one of the two royal burying places and the royal treasury was here. The city is said to have been burned by Alexander of Macedon in 331 B.C. The city of Istakhr, important in Mohammedan times, was connected with Persepolis and was known for its culture and its fortress.

**PERSEUS**, in Greek mythology, son of **ZEUS** and **DANAË**, grandson of Acrisius, as a babe had been cast into the sea with his mother and rescued at the island of Seriphos. Polydectes, King of Seriphos, wanting to woo Danaë, sent her son Perseus in quest of Medusa's (see **MEDUSA**) head to be rid of him. **HERMES** gave him a scimitar and **ATHENA** a bronze shield in which might be reflected the Medusa's head, which turned to stone those who looked at it. The nymphs gave him winged sandals, a pouch and an invisible cap. Thus equipped, he accomplished his object, and taking the head before Polydectes turned him to stone. On his way home he had rescued **ANDROMEDA** from a sea monster and married her.

**PERSEUS** (gen. *Persei*), a northern constellation nearly always visible and passing overhead during early evenings in January. It was named after the hero from Greek mythology who rescued the Princess Andromeda by petrifying the sea monster, about to devour her, with the head of Medusa. The head was supposed to be represented by **ALGOL**, the second brightest star, which is variable in light. The brightest star, Alpha Persei, is a little whiter than the sun and nearly 1000 times as brilliant. In the northern part of the constellation may be found the double cluster, two magnificent clusters of stars, visible to the naked eye and through a field glass showing numerous individual stars. See **STAR: map**.

**PERSHING, JOHN JOSEPH** (1860- ), American general, was born Sept. 13, 1860, in Linn County, Mo. He was graduated from West Point in 1886, when, as lieutenant in the U.S. Cavalry, he took part in campaigns against the Apache Indians in New Mexico and Arizona (1886) and the Sioux Indians in Dakota (1890-91). In 1891-95 he was military instructor at the University of Nebraska, taking opportunity to study law, and in 1897-98 he was instructor in tactics at West Point. During the Spanish-American War, Pershing served in Cuba as major of volunteer cavalry, and upon his discharge on May 12, 1899, he organized and was chief of the Bureau of Insular Affairs until Aug. 16, 1899. In Nov., 1899, he was transferred to the U.S. Cavalry in the Philippines, where he served until June, 1903. During this time he was at first adjutant general in the Department of Mindanao until June, 1901, having been commissioned captain of U.S. Cavalry in February of that year. Then he served as commander of military operations against the Moros, Oct. 2, 1902 to June, 1903. During 1903-06 Pershing was on the General Staff, U.S. Army, being military observer with Kuroki's army in Manchuria, Mar. to Sept., 1905, and acting as military attaché at Tokio, Japan, 1905-6. For his signal services in the Philippines, he was promoted by President Roosevelt to brigadier-general, on Sept. 20, 1906, from the previous rank of captain, and over many senior officers, a procedure which caused much opposition and comment. He returned to duty in the Philippines in Dec., 1906, being commander of the Department of Mindanao and governor of the Moro Province, strenuously pushing warfare against the Moros, until their defeat at Bagsag, June 12, 1913. In that year Pershing was transferred to Presidio, Cal., where he was given command of the 8th Brigade.

Pershing served temporarily on the Mexican border in command of El Paso patrol district, and in Mar., 1916, he was given command of the U.S. punitive expedition into Mexico in pursuit of Villa. He was appointed major-general, Sept. 25, 1916. Pershing was commander-in-chief of the American Expeditionary Forces in France, 1917-19. He was made general of the U.S. Army, Oct. 6, 1917, and by an act of Congress was given the title "General of the Armies of the United States," Sept. 4, 1919. Throughout his difficult negotiations with the Allies, Pershing insisted that American soldiers fight under their own flag, and although some critics have asserted that this insistence was costly, Pershing's ultimate success against the Germans in the St. Mihiel and Meuse-Argonne drives indicated that his troops were most effective when fighting as a unit. He became Chief of Staff of the U.S. Army, July 1, 1921, retiring Sept. 12, 1924. General Pershing received the American Distinguished Service Medal and many foreign decorations of distinction. In 1932 he received the Pulitzer Prize for the best book of the preceding year on the history of the United States, his book being *My Experiences in the World War*.









